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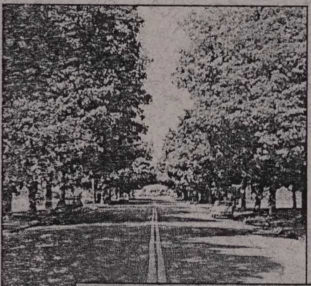
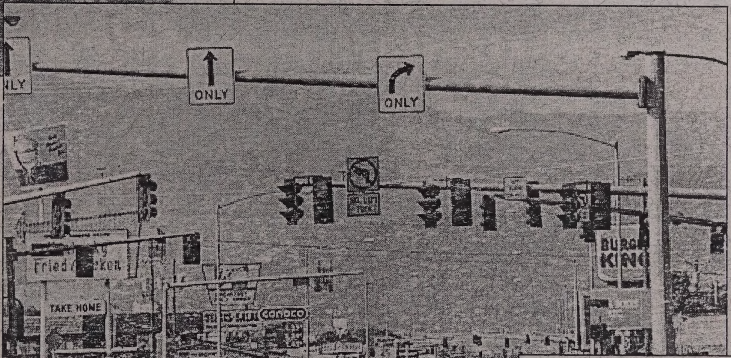
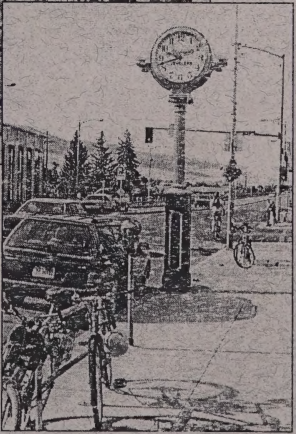
Missoula Transportation Plan Update

Missoula, Montana







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Corrections to the Missoula Urban Area Transportation Plan,

1996 Update

The following are corrections to the second page under "Acknowledgments":

1. Dan Kemmis is listed at the Mayor. This should be changed to "Mike Kadas, Mayor".
2. Anne Guest is listed as a Non-Voting member of Missoula Transportation Policy Coordinating Committee. This should be deleted because she is a Non-Voting member of Missoula Transportation Technical Advisory Committee.
3. "Missoula Transportation Advisory Coordinating Committee" should be listed as "Missoula Transportation Technical Advisory Committee"
4. Noel Larrivee, MR TMA (Non-Voting) should be added under Missoula Transportation Technical Advisory Committee.

Missoula Transportation Plan
1996 Update

Prepared for the
Missoula Office of Planning and Grants

In Cooperation with the
Montana Department of Transportation

and

Department of Transportation
Federal Highway Administration

Prepared by
Robert Peccia and Associates
Helena, Montana

Adopted October __, 1996
Missoula Transportation Policy Coordinating Committee

This planning document was prepared by Robert Peccia & Associates under the direction of the Missoula Office of Planning and Grants. The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Federal Highway Administration or the Montana Department of Transportation.

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The authors would like to extend a special thank you to all of the citizens who shared their opinions and concerns with the planning team in an effort to produce the best transportation plan possible for their community.

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Executive Summary

Residents of Missoula have made it clear that they are not interested in a traditional Transportation Plan similar to what has been the standard in Montana for the past several decades. It is no longer acceptable to simply continue to increase the size of the transportation system to meet the anticipated demand. Past Transportation Plans have focused primarily on satisfying anticipated traffic demand through road system improvements. There was little effort spent on investigating other modes of transportation or transportation alternatives in the past Plans. There has never been any real attempt to resolve the anticipated traffic problems by managing the traffic demand.

It is important to realize that increases in traffic demand are the result of growth within the community. Every house and business that is built or expanded within commuting distance of Missoula adds to the vehicle loadings on the street network. This Plan reacts to the growth that is expected to occur within the Missoula area during the next twenty years. The community can manage the corresponding increase in traffic demand in one of two ways: 1) by aggressively managing development within the greater Missoula area, which includes areas outside of Missoula County, or 2) by encouraging people to use alternative modes of travel through the use of Transportation Demand Management (TDM) strategies. During the process of developing this Plan it became clear that Missoula residents would like to use both of these approaches. By managing growth and encouraging development within or near the existing city limits, the use of TDM is more effective. Community infill also invites the use of alternative modes of transportation such as walking, bicycle riding and use of the transit system.

The Missoula community has recently become involved in a Growth Management Process. Since increases in traffic are primarily the result of residential and commercial growth it is imperative that the Transportation Plan and Growth Management Plan are both working toward the same community goals. These goals include: providing non-motorized transportation alternatives; optimizing air and water quality; providing access to community services, employment opportunities, and schools; cultivating open space resources; minimizing vehicle miles traveled; maximizing cost effectiveness; and improving the efficiency of the existing road system.

Public involvement occurred throughout the transportation planning process. An Ad Hoc Citizens Transportation Advisory Group (CTAG) was created specifically for the purpose of providing the planning team with public input during the development of the plan. Numerous public meetings and workshops were held to allow the public an opportunity to share their issues and concerns.

This update of the Transportation Plan goes beyond past efforts in that it includes a comprehensive analysis of the entire transportation network in the greater Missoula area, including the pedestrian, bicycle, and transit systems. This Plan also includes a complete analysis of TDM strategies that may be applicable for Missoula.

During the development of the Plan the public made it clear that the Plan should include a blend of projects and programs that address the needs of all of the various modes of transportation used in the community. This Plan includes approximately $111 million worth of recommended projects and programs that address the needs of the driving public and the transit system, while bringing parity to the pedestrian and bicycle systems. The anticipated distribution of these funds (most of which are generated by the driving public through user fees) is as follows: 69% is to be spent on road improvements, 22% on pedestrian and bicycle facility improvements, 7% on improvements to the transit system and 2% on TDM programs. The recommendations include 12 miles of new roads, 15.5 miles of widened roadways, 41.5 corridor miles of sidewalk and 73 corridor miles of bike lanes, bike routes, and off-road trails. In addition, the plan contains a full range of safety projects, including intersection and corridor lighting improvements.

It is important to note that the recommended road improvements contained in this Plan address traffic problems that currently exist on the arterial road network. The anticipated increase in traffic volumes will make these arterials less effective in the future without the recommended system upgrades. In fact, it is acknowledged that even with the recommended road improvements, traffic volumes on some arterials will grow to the point that traffic congestion will still occur.

Unfortunately, as the arterial network approaches capacity, drivers use neighborhood streets to avoid congestion on the arterial routes. Because of this fact, it is necessary for Missoula to establish an active traffic calming process to address local neighborhood traffic problems. The traffic calming process should have a structured methodology and a well-defined approach to address these types of neighborhood complaints.

This Plan and the projects and programs recommended in it have been developed in full compliance with the provisions of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). The requirements of the Civil Rights Act and the Americans with Disabilities Act were considered during the formulation of the Plan. The Plan has been structured as an intermodal plan that is responsive to all of Missoula's transportation needs and provides the framework for comprehensive and coordinated transportation planning. The movement of freight by road and rail, and the related needs and facilities were considered in the development of the Plan recommendations. The Plan continues to provide connectivity between roads within the planning area and roads outside the area. Access to the rail system and the regional airport will also be provided, thereby meeting the needs of tourists and visitors to the community as well as area residents. The Plan also provides for road and trail access to local parks and regional recreation areas.

This Plan is consistent with Missoula's energy conservation programs, goals, and objectives. In addition, the Plan is compatible with existing comprehensive land use, development, and environmental plans. By providing an appropriately sized road network, the Plan protects neighborhood integrity while providing the means for the efficient movement of people and goods that form the social and economic basis of the community.

This Plan meets all current air quality requirements of the U.S. Environmental Protection Agency. It is acknowledged that the EPA standards may change with time and future updates of this Plan will be required to reflect such changes. Missoula is currently designated as a non-attainment area for two pollutants, carbon monoxide (CO) and particulate matter (PM_{10}). The EPA requires the Plan to demonstrate that the future CO emissions resulting from the implementation of the recommended improvements will be lower than the CO emissions that occured in 1990. The EPA also requires the Plan to demonstrate that future PM_{10} emissions do not exceed a budget of 16,119 pounds/day. The recommended improvements contained in this Plan were analyzed to ensure that they help make the air quality better than it would be if this Plan were not implemented. A summary of the air quality analysis is shown in the table below. The complete air quality determination for the Plan is contained in Appendix D of this document.

Summary of Air Quality Analysis

Emission Pollutant (lbs/day)	**1990**	**1998**	**2005**	**2015**	**2015 Budget**
CO without Recommended Improvements	189,481	68,688	54,074	58,697	N/A*
CO with Recommended Improvements	N/A	68,642	53,816	57,608	N/A*
PM_{10} without Recommended Improvements	11,302	N/A	N/A	N/A	N/A
PM_{10} with Recommended Improvements	N/A	12,159	13,357	15,538	16,119

* There is no CO Budget. Rather, the Plan improvement package is required to have a positive impact on CO levels. In addition, the 1990 CO levels must not be exceeded.

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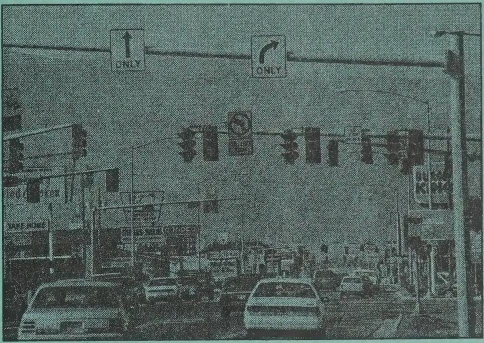
Chapter 1: Introduction and Background



1.0 Introduction and Background

This Transportation Plan is intended as a guide for the decision makers in the Missoula community. It contains a multi-modal analysis of the transportation system in the Missoula area. This Plan also includes an examination of Transportation Demand Management (TDM) and growth management techniques that will help encourage the use of alternative modes of travel. This document identifies the problems with the various transportation systems and offers recommendations in the form of improvement projects and progressive programs that will relieve existing problems and/or meet future needs.

1.1 Project Background

All urban areas in the United States are required to have a current Transportation Plan in order to qualify for federal funding for highway improvements. It is also required that this Plan be updated every three years. The Plan was last initiated in 1985 and adopted in 1987.

In October of 1994, the Missoula Office of Planning and Grants solicited proposals to update the 1985 Transportation Plan. Robert Peccia & Associates was subsequently selected to perform the work in December, 1994.

Transportation planning in the Missoula area is overseen by the Transportation Policy Coordinating Committee (TPCC) and guided by the Transportation Technical Advisory Committee (TTAC). Both of these groups are made up of representatives from the City of Missoula, Missoula County, the Montana Department of Transportation (MDT), the Federal Highway Administration (FHWA), and other community organizations. An Ad-hoc Citizens Transportation Advisory Group (CTAG) was formed for the expressed purpose of providing feedback on local issues and concerns and assisting in the development of the Transportation Plan Update.

1.2 Study Area

The study area for this project was established by the Office of Planning and Grants and includes all of the area that is generally bounded by Bonner to the east, Lolo to the south, Frenchtown to the west and Evero to the north. **FIGURE 1-1** shows the exact boundaries of the study area. It is important to note that the study area used for this update is much larger than the Federal-Aid Urban Boundary. The study area for this Plan is actually more than twice the size of the area studied in the 1985 update. The larger area was chosen so that the traffic analysis and evaluation would include the impacts of commuter traffic being generated by the smaller outlying communities in the Missoula area. The larger study also allows for better modeling of the traffic that is anticipated to occur as a result of development in the outlying areas of the Missoula community.

1.3 Transportation Planning Goals

The primary goal of this update of the Plan is to develop a strategy that will produce an integrated intermodal transportation system for the greater Missoula area. The overall transportation system consists of four principal modes of travel including conventional road traffic (private cars and trucks), pedestrian, bicycle, and transit systems. In past transportation planning efforts the emphasis has been on the road system with only the car and truck traffic in mind. It is a goal of this Plan to incorporate a complete review of the pedestrian, bicycle, and transit systems and provide recommendations that will address any deficiencies in their relative infrastructure.

Another goal of this Plan is to help organize and prioritize the projects and programs that are being considered in Missoula. There has been a considerable amount of transportation planning done in the past that has independently evaluated various aspects of the transportation system. The thoughts and recommendations produced in these past planning efforts need to be combined into one cohesive guiding document.

The final goal is to produce a Plan that is actively used to guide the transportation decision making process throughout the course of the next 20 years. The Plan must be sustainable, financially responsible, and provide real multi-modal opportunities to all travelers in the community. The Plan must be responsive to the quality of life issues that are important in Missoula, such as air quality, neighborhood integrity, and safety. The Plan should produce a transportation system that has the following characteristics:

1. Efficient, Affordable, and Sustainable
2. Friendly to Neighborhoods and Commerce
3. Attractive and Enjoyable
4. Accessible and Equitable
5. User-friendly
6. Safe and Healthy

1.4 Previous Transportation Planning Efforts

In the course of data collection, past plans and studies were obtained. These documents were reviewed and applicable thoughts were incorporated into this Missoula Urban Area Transportation Plan. The contributing documents are as follows:

Bridge Needs Study. Robert Peccia and Associates. Prepared for Missoula Office of Community Development. January, 1990.

City of Missoula Capital Improvements Program FY95-99. July, 1994.

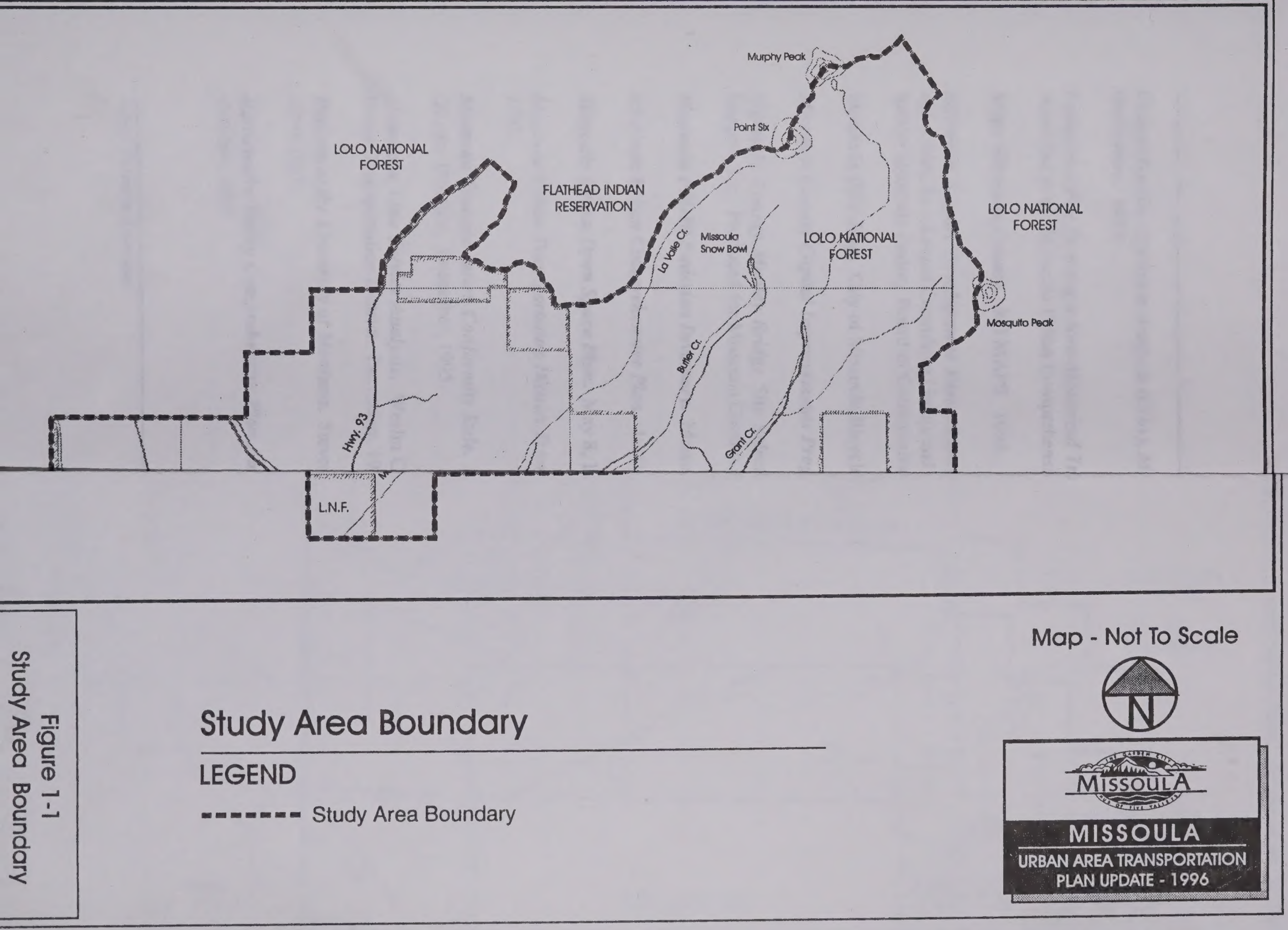


Figure 1-1
Study Area Boundary

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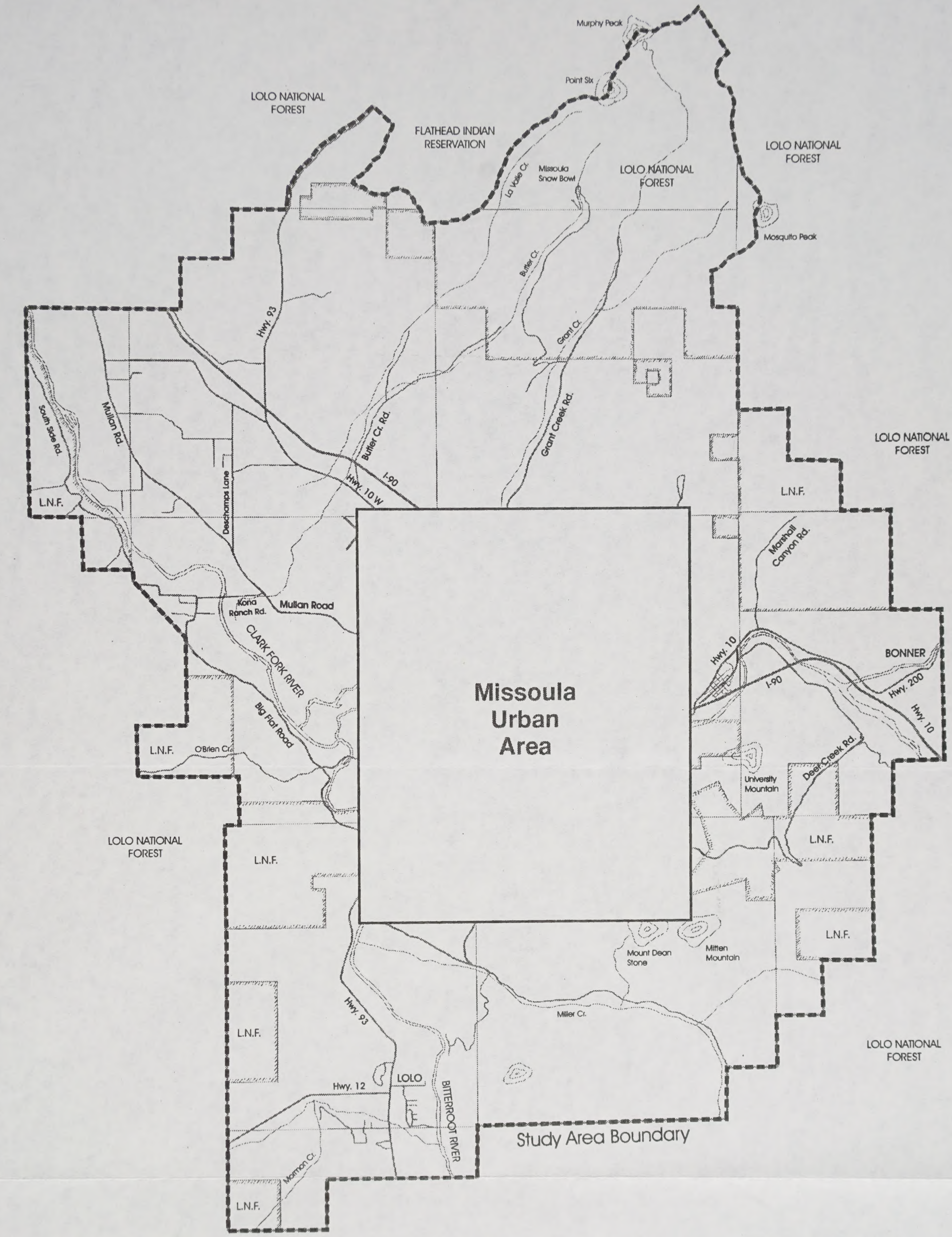

Figure 1-1
Study Area Boundary

Study Area Boundary

LEGEND

- - - - - - - Study Area Boundary

Map - Not To Scale

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Missoula Airport Development Park Master Plan & Strategic Implementation Plan. HOH Associates, Inc., Leland Consulting Group, and Druyvestein, Johnson and Anderson, Inc. Produced for the Missoula County Board of Commissioners. August, 1994.

Missoula Bike Map. City of Missoula Bicycle Program. 1984.

Missoula County Capital Improvements Program. DeVore, John. 1994.

Missoula County Maclay Bridge Site Selection Study Environmental Assessment. Carter & Burgess, Inc. Produced for Missoula County. April, 1994.

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Missoula Urban Open Space Plan. May 8, 1995.

Missoula Urban Transportation District Transit Development Plan, Annual Update. September, 1995.

Montana Transportation Conformity Rule. Montana Department of Environmental Quality, Air Quality Division. December, 1995.

Mountain Line Service Analysis. Weslin Consulting Services, Inc. Prepared for the Missoula Urban Transportation District. December, 1994.

Parking at the University of Montana. Steven R. Holloway, Dennis Leonard, and H.E. Wilkinson. 1986-1987.

Rattlesnake Valley Comprehensive Plan Amendment. Prepared for the Missoula City Council. October, 1995.

Rattlesnake Valley Transportation Plan. Druyvestein, Johnson & Anderson and Robert Peccia & Associates. Produced for the City of Missoula. 1992.

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Traffic Signal Operation Improvement Study. Barton-Aschman Associates, Inc. 1994.

TranPlan 21 Policy Paper. DYE Management Group, Inc. Produced for MDT. December, 1994.

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Working Papers Nos. 2 and 3, Vol. 2 Master Plan Update and Noise Compatibility Program: FAR Part 150. Peat, Marwick, Mitchell, & Co. Produced for Johnson-Bell Field - Missoula County Airport Authority. August, 1985.

1990 Base Year Carbon Monoxide Emission Inventory, State of Montana - Missoula County. Ken Anderson, Jerry Schneider, and Mike Kress. November, 1992.

1.5 Concurrent Planning Projects

Several other planning efforts were ongoing during the development of this Plan update. These planning efforts include a study of the traffic signal system, an intersection review at the South/Brooks/Russell intersection, a new Wastewater Treatment Facility Plan, a Growth Management Plan, a plan for the Miller Creek area, and an Airport Development Park Plan. Special effort was made to exchange thoughts and interact with the other planning teams so that the Transportation Plan can benefit from the knowledge that is available through these other planning efforts.

1.6 Public Involvement

The primary goal of the communications program for the Missoula Transportation Plan Update (MTPU) was, simply stated, to keep the public informed and involved in the project. A second goal of the process was to integrate the opinions and issues identified by the public as a result of the program into the project approach and methodology, wherever feasible. The methods that were used to achieve these goals included: formation of advisory committees, outreach to key constituencies, outreach to neighborhoods, education of decision makers, news releases, and public events.

1.6.1 Summary of Program Components

Advisory Committees
The planning process was guided by two advisory committees. An ad hoc Citizens Transportation Advisory Group (CTAG) was created for the purpose of assisting in this planning process. The other advisory committee that provided guidance during this planning process is the Transportation Technical Advisory Committee (TTAC). This committee consists of members with technical backgrounds from the City, County, MDT, FHWA, and several pertinent community organizations such as the Missoula Redevelopment Agency, Mountain Line, and the Missoula Parking Commission. A summary of the interaction between these groups and the planning team are identified in the following sections.

Citizens Transportation Advisory Committee (CTAG)
The Citizens Transportation Advisory Committee (CTAG) met a total of nine times prior to completion of the Draft. The mailing list for the CTAG consisted of over 100 names. Actual attendance varied from meeting to meeting, with a high of 35 and a low of 10. The goal of the meetings was to engage CTAG members in the ongoing study by asking their review of interim documents and products, and their opinions and prioritization of various improvement projects.

In the course of the various meetings it became clear that CTAG members supported a variety of options on specific topics but shared a concern that those topics be addressed, regardless of their own personal opinions on the subjects. Some key issues or themes were identified which included: cost effectiveness, reducing the dependence on the automobile, increasing bicycle and pedestrian safety, diversifying the mix of alternative transportation options, correcting existing capacity problems, and finding ways to respond to continuing growth pressures.

Transportation Technical Advisory Committee (TTAC)
The TTAC is an established group of technically-oriented individuals representing most of the agencies in the community that have transportation interests. The TTAC was the principal guiding force behind this plan and met on a monthly basis during the development of this Plan. The consultant presented information relating to all facets of the plan development at these meetings.

The TTAC participated as an active partner in the review of the planning material and provided guidance to the consultant throughout the planning process.

1.6.2 Public Involvement Events

Election Day Survey Results

The first opportunity Missoula residents had for input into the Missoula Transportation Plan was an Election Day Exit Poll Survey conducted during the November 1994 General Election. The unsupervised "exit polling" stations were set-up at 25 Missoula voting locations. Exit poll stations were placed within or adjacent to voting areas, and voters voluntarily chose whether or not to complete a two page questionnaire.

The survey asked about citizen opinions regarding current and future traffic conditions in Missoula, and what citizens felt should be the community's priorities for improving its transportation services. The survey also inquired about citizen support for major road improvements and actions to increase use of alternative transportation options such as car pooling, bicycling, walking, and the Mountain Line bus service.

Of the 28,555 Missoula voters, 6,132 completed the transportation questionnaire. This 21% response rate was higher than expected. And although the survey provides good data from which to gain a pulse of opinion in Missoula, it is probably not a measure of the feelings of a representative cross-section of Missoula citizens. Voters in general tend to be older, better educated, and wealthier than the population as a whole. Furthermore, participating voters self-selected whether or not to participate in the survey. Voters interested in transportation issues were the most likely to take the time to complete the survey. Survey results should be viewed as input from 6,000+ citizens interested in Missoula Transportation Planning.

Responding voters graded overall traffic conditions in Missoula as a "C-". Voters were more dissatisfied with traffic conditions on north-south roads than its east-west roads. Thirty-four percent of respondents identified "Serious Problems" on north-south roads; east-west roads were identified as having "Serious Problems" by 19% of the voters. In general, voters were more dissatisfied with the community's major road network than with local streets. Importantly, the majority of voters felt that Missoula traffic conditions will get "Much Worse" in the next five years.

Voter priorities for transportation improvements were to:

1. Improve coordination & timing of traffic signals to speed up traffic flows.
2. Increase ridership on Missoula's "Mountain Line" Bus Service - add buses, routes, bus stops, operate more hours.
3. Move drive-through truck traffic from Reserve Street to a Truck Route located west of the airport.

4. Widen/add lanes on major roads to accommodate more traffic.

5. Encourage more people to car pool to work and school.

6. Encourage more people to bicycle instead of driving (expand & enhance bicycle facilities).

7. Relocate US Highway 93 from Reserve Street to west of airport (drive-through traffic would be routed outside of urban area).

8. Encourage more people to walk instead of driving (repair & build new sidewalks, walking paths, & improve crosswalks & crosswalk signals).

About one third (31%) of responding voters indicated that if substantial improvements were made in transit system convenience and reliability, they would be willing to use the local bus service 2 to 5 days a week. Thirty-six percent of respondents indicated they would ride their bicycle 2 to 5 days a week if substantial improvements were made to the community's bicycling facilities (weather permitting). Forty-two percent of responding voters indicated that with an extensive system of bike paths separated from roads, they would bicycle 2 to 5 days a week instead of driving. Major sidewalk improvements would cause a third of respondents to walk instead of drive 2 to 5 days a week. Willingness to car pool was less than for the other TDM measures, though a quarter of respondents indicated they would participate in computer matching service to establish car pools.

A large number of respondents indicated they regularly drive on side streets to avoid traffic congestion on main roads. Only about 1 in 10 voters indicated they were able to change their travel characteristics during "AIR ALERT DAYS." The most frequent action taken during "AIR ALERT DAYS" was to drive cars less.

Most respondents were employed outside the home, and drove alone to their jobs. Bicycling was the most frequently used alternative travel mode for survey respondents.

For more details regarding the survey see Appendix A. Appendix A includes an example of the survey distributed as well as the tabulated responses.

Charette

The Charette was held on March 30 and 31, 1995. At the time the transportation planning process was initiated the community had a wide variety of planning activities already underway. In order to avoid meeting "burn out" the charette was held to take the place of a series of traditional scoping sessions and kick off meetings. The Charette process resulted in the scheduling of eight meetings, all within the two-day time frame. Groups were invited to the Charette based on their common areas of interest in order to focus their input. Each of the meetings followed the same agenda: a brief presentation on the objectives and schedule of the process, identification of existing problem areas, listing of key players that members of the interest group felt should be involved in the process, and the creation of an issues list for each of the interest groups.

The interest groups that attended the Charette included: City, County and MDT staff; freight haulers, railroad and airport personnel; emergency service - fire, police, sheriff, and ambulance; all local school districts; city council members and county commissioners; transit providers; and members of the public. Total attendance at the eight sessions was over sixty individuals.

As a result of the Charette process a variety of key issues were identified. The issues generally fell within three categories: specific problem intersections or sections of roadway, identification of "big picture" problems, and the identification of potential solutions or remedies. The list of problem intersections and roadway sections was long and comprehensive. Generally, each group identified many of the same problem areas although their reasons for considering them problems varied based on their perspective.

The big picture problems that were identified during the sessions focused on two primary areas: the effects of continuing growth on transportation facilities, the existence of inadequately sized facilities, and the lack of public acceptance of alternative transportation alternatives. The effects of population growth on both traffic volumes and transportation infrastructure was commented on in each of the groups.

The existence of inadequately sized facilities was noted by all of the groups. General areas of concern included north/south facilities, key intersections, railroad crossings.

The ongoing dependance on the automobile as a primary form of transportation was noted in many of the groups. Although most individuals acknowledged that they would like to see increased use of alternative methods of transportation, they also indicated that they were not optimistic that a high rate of use for the alternative options would actually occur. The use of both incentives and disincentives was perceived as key to changing travel habits of the population.

In all cases the potential costs associated with the construction and upgrading of infrastructure was identified as the biggest barrier to implementation.

Community Futures Fair

The Fair was originally conceived of as a Transportation Fair. However, following extensive discussions with CTAG, the OPG, and other city staff, it was decided to expand the focus of the Fair and rename if the Community Futures Fair. The Fair was held on Saturday, September 16, 1995, from 10 a.m. until 3 p.m. The activities at the event included: a video room where educational videos on a variety of topics played continually for the day, a map room where participants were asked to mark on project maps both problem areas and suggestions for improvements, small mini-lectures and workshops, booths and displays and several hour-long workshops. The participants in the Fair represented a cross section of the planning efforts in the city and county, as well as a variety of community organizations. The groups and projects that were represented at the event included the Neighborhood Network, Mountain Line, North Reserve project, Wastewater Facilities Update project, Feet First, Missoula Land Trust, Air Quality Advisory Council, City of Missoula Pedestrian/bicycle program, We Are Missoula, and the Historic Preservation Society.

The release of the results of the socioeconomic study and the growth projections for the future were timed to coincide with the Fair event. Extensive press coverage was generated including newspaper articles, television 'spots', radio announcements, and community service announcements.

Virtually all of the individuals who attended the Fair (over 100 individuals) took the time to visit each of the 10 booths, as well as the map room and video exhibits. Rather than attend the mini-lectures or the workshops, some individuals preferred to engage in discussion with the staff, volunteers and consultants who were working in the booths. A variety of animated discussions took place throughout the day at many of the booths. Generally speaking people attended the event for two reasons - to check on the status of planned improvements for their home neighborhood and their highest priority trouble spot, or to ask questions about the long-term methods that were available to minimize congestion without incurring substantial community expense.

Neighborhood Meetings

After consultation with the CTAG it was determined that the neighborhood outreach would be most effective if it was targeted to 'regions' within the community rather than at the myriad of individual neighborhood groups. With this in mind a map of the project area was used to identify a total of eight 'regions', which included all of the 100+ neighborhood groups listed in the Neighborhood Network mailing list. Eight meetings were scheduled and post cards were sent to each of the groups, informing them of the purpose and date of the meetings. Of the eight meetings that were scheduled five were actually held. The attendance at these meetings, held during August of 1995, was quite low. As a result of the low attendance rates, staff and the consultant decided to cancel the remaining three meetings and concentrate energy and budget on ensuring increased turnout at the Community Futures Fair, the Draft Review Workshops, and the Public Hearing.

Decision Makers Workshop

The Decision Makers Workshop was held on September 15, 1995. The purpose of the Workshop was to educate both staff and community decision makers of the technical aspects of intermodal and multi-modal transportation systems. The transportation demand specialist for the project presented a seminar on the terminology, methodology, strategies, costs, barriers to implementation, incentives, and effectiveness of Transportation Demand Management (TDM). The presentation was interspersed with questions from the audience and followed by a more formal question and answer period. A TDM strategies rating survey was distributed to the attendees and they were asked to fill it out prior to leaving the workshop. The results of the survey were presented at subsequent TTAC and CTAG meetings.

Alternatives Workshop

A special workshop session was held for the purpose of examining and discussing the transportation alternatives that could possibly be considered in this plan. The consultant's TDM specialist conducted this workshop with members of the TPCC, TTAC and the City Council in attendance. All of the possible TDM and Growth Management strategies were examined and discussed during this workshop.

Chapter 10 contains a detailed explanation of all of the TDM concepts considered for use in the Missoula area. These concepts included both public and private sector strategies as well as implementation mechanisms. The concepts were grouped into four categories with varying degrees of cost effectiveness. A series of preferred TDM strategies were identified as an output product of this workshop. The preferred strategies were tested using a state-of-the-art TDM computer model. This model uses the local travel characteristics of the Missoula area and evaluates the potential travel reduction produced by each TDM strategy.

Draft Review Workshops

The consultant conducted two public information workshops after the draft document was produced to review the elements of the draft with the general public. All of the aspects included in the draft were open for discussion and comment. A summary of the comments received in these workshops is included in Appendix C.

Public Hearings

Two public hearings were conducted near the completion of this planning process to receive public comment on the Draft document. The first public hearing covered all elements of the draft document. After reviewing the comments received at the first public hearing it was determined that it would be beneficial to extend the comment period and hold a second public hearing. This second public hearing focused on the transit and TDM aspects of the Plan. Comments received during both of these public meetings are summarized and included in Appendix C.

Chapter 2: Roadway System Analysis

2.0 Roadway System Analysis

This chapter of the Transportation Plan Update is devoted to the identification of the current roadway system in the Missoula Urban Area. The initial step in taking such an inventory is compiling data describing the physical characteristics and the operation of the current transportation system. Data gathered for this study provided information about roadway widths, intersection geometrics, lane use, signal timing, and design features of major arterials. Studies were performed to identify existing traffic volumes and congested locations on the major street network. The accident history of the major street network was also reviewed to identify problem locations.

2.1 Major Street Network

This Transportation Plan Update addresses the problems that occur on the most important streets in the Missoula area. The major street network generally consists of streets and roads on the Federal-aid system as well as other facilities that provide vital links in the transportation system. **FIGURES 2-1** and **2-2** show the existing major street network.

Elements of the major street network are functionally classified as principle arterials, minor arterials, collectors, and local streets. Functional classifications are assigned based on the facility's use, operational characteristics, and overall importance. Principle arterials are the corridors with the highest traffic volumes and longest trip lengths. Minor arterials provide service for trips of moderate length, allowing a lower level of mobility than principle arterials. Collectors provide land access, channeling traffic from the arterial system to local streets. All remaining streets are local streets, which provide direct land access.

A complete analysis of the corridors in Missoula's major street network is presented in Chapter 9 of this document.

2.2 Traffic Volumes

Traffic volumes are periodically monitored at more than 160 locations within the study area identified for the Transportation Plan Update. These short-term surveillance counts are collected by the Montana Department of Transportation, Missoula County, and the City of Missoula. The purpose of this extensive traffic counting program is to provide reliable data on historical traffic volumes and other pertinent characteristics. **FIGURE 2-3** shows the 1994 traffic volumes on major roads and streets in the Missoula Urban study area. At this time, the highest volume of traffic in Missoula occurs on the segment of Brooks Street between Russell and Reserve. Approximately 28,300 vehicles travel this section of road each day.

2.3 Traffic Signal System Analysis

There are currently 50 traffic signals in the Missoula Urban Area. Eighteen of these signals are included in one of five interconnected signal systems. The locations of existing signals and signal systems are shown in **FIGURE 2-4**.

A Level of Service study was performed for all existing signals during the morning and evening peak hours. The results of this analysis are presented in **FIGURE 2-5**. Drivers are currently experiencing notable signal delay at the following intersections:

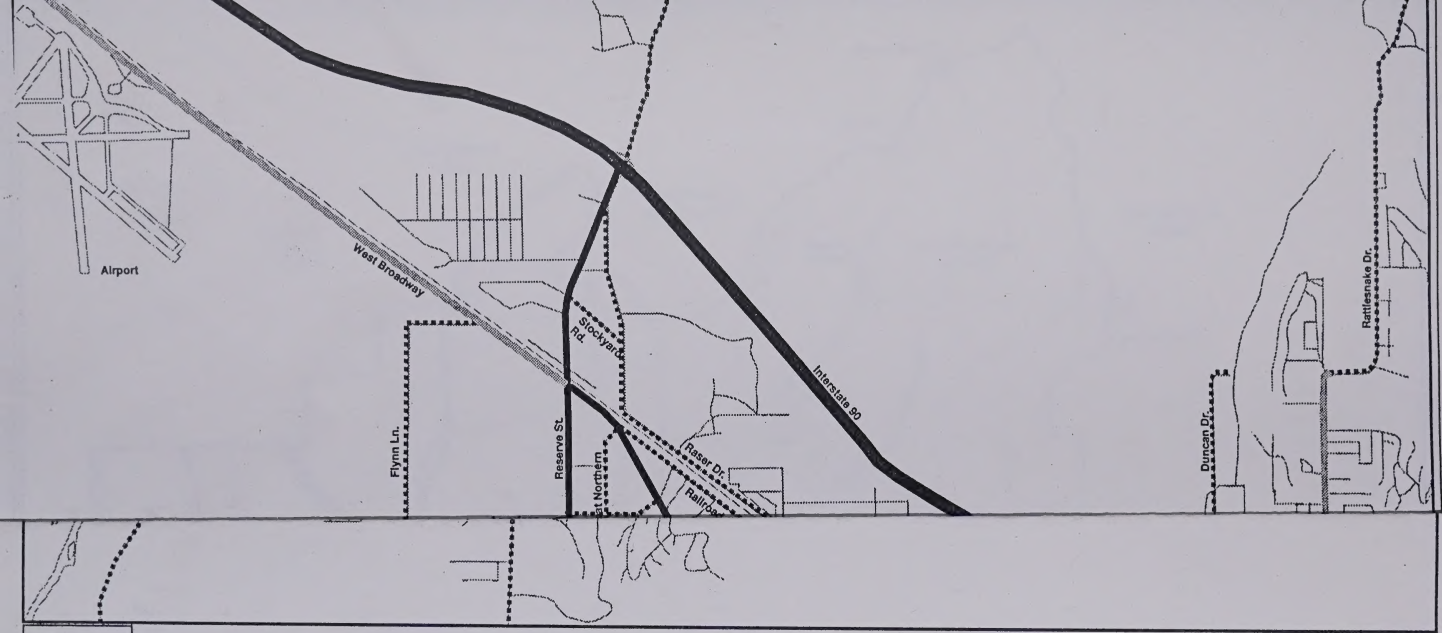
Brooks/South/Russell
Brooks/Reserve
Mullen/Reserve
Broadway/Russell
3rd/Russell

A comprehensive analysis of the Missoula traffic signal system is presented in the *Traffic Signal Operation Improvement Study* (1995) produced by Barton-Aschman.

2.4 Accident Analysis

As part of the Transportation Plan Update, an investigation was conducted to identify accident characteristics and recurrent accident locations in the Missoula Urban Area. Summaries of accident records for the road and street system were obtained from the Highway Information System (HIS) maintained by the Montana Department of Transportation. All motor vehicle accidents reported for the period January 1, 1992 through December 31, 1994 were reviewed for this analysis.

Locations with High Accident Rates - A detailed review of the HIS accident data was performed to find locations where high numbers of accidents occurred during the three year study period. Printouts of the composite accident histories for intersections on the major street network were examined to identify problem areas. All locations with an average of 4 or more accidents per year were identified. Accidents were assigned values of one, two or five depending whether they resulted in property damage only, injuries, or fatalities, and a severity rating was calculated for each location. **TABLE 2-1** lists the locations where accidents occurred frequently. **FIGURE 2-6** graphically represents the locations of recurrent accidents in the Missoula Urban area.



Existing Major Street Network - Urban Area

LEGEND

▬	Interstate
▬	Principal Arterial
▨	Arterial
┅	Collector

Map - Not To Scale

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Figure 2-1
Existing Major
Street Network - Urban Area

2.3 Traffic Signal System Analysis

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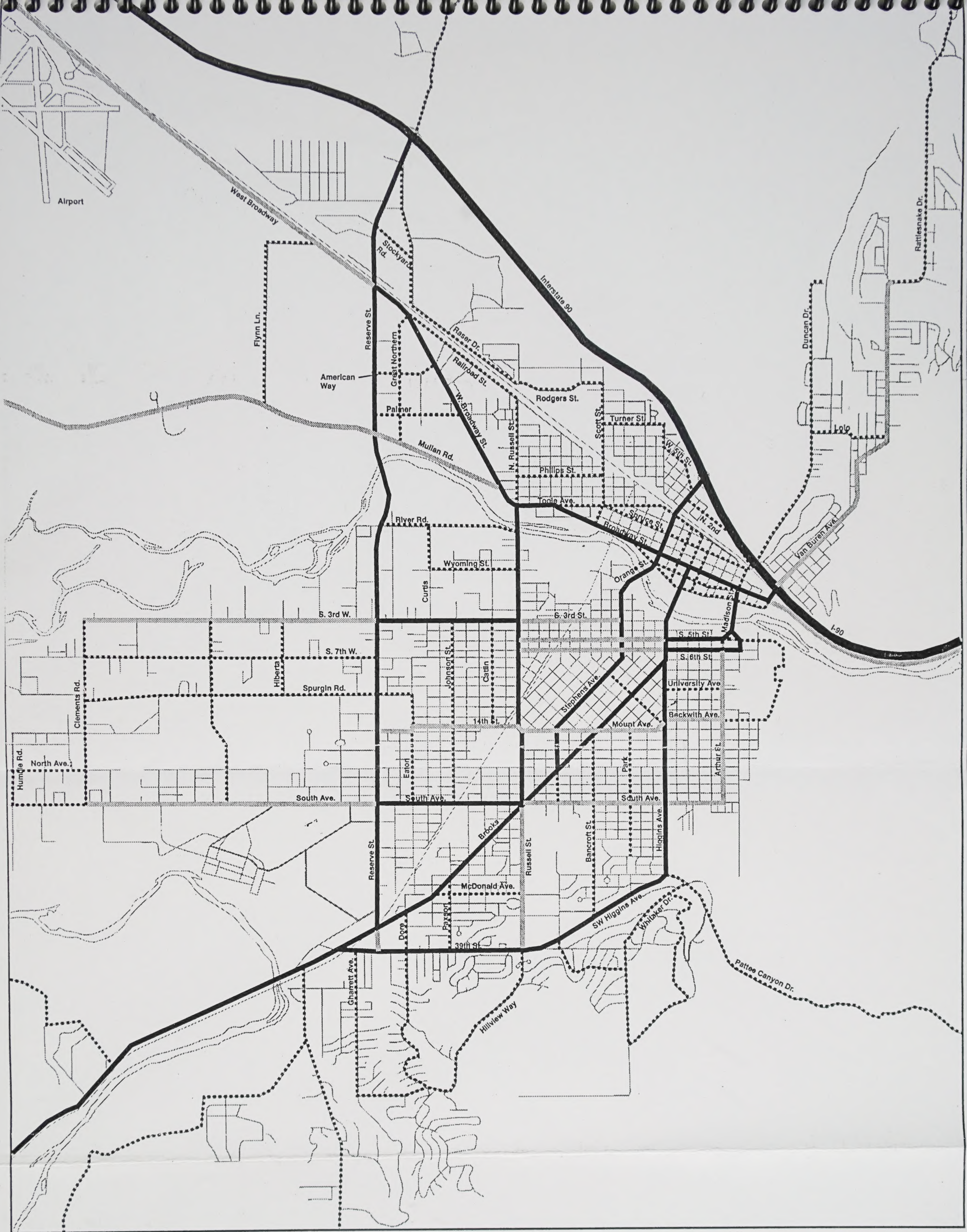

Existing Major Street Network - Urban Area

LEGEND

- ▬ Interstate
- ━ Principal Arterial
- ▨ Arterial
- ┈ Collector

Map - Not To Scale

N

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URBAN AREA TRANSPORTATION
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Figure 2-1
Existing Major
Street Network - Urban Area

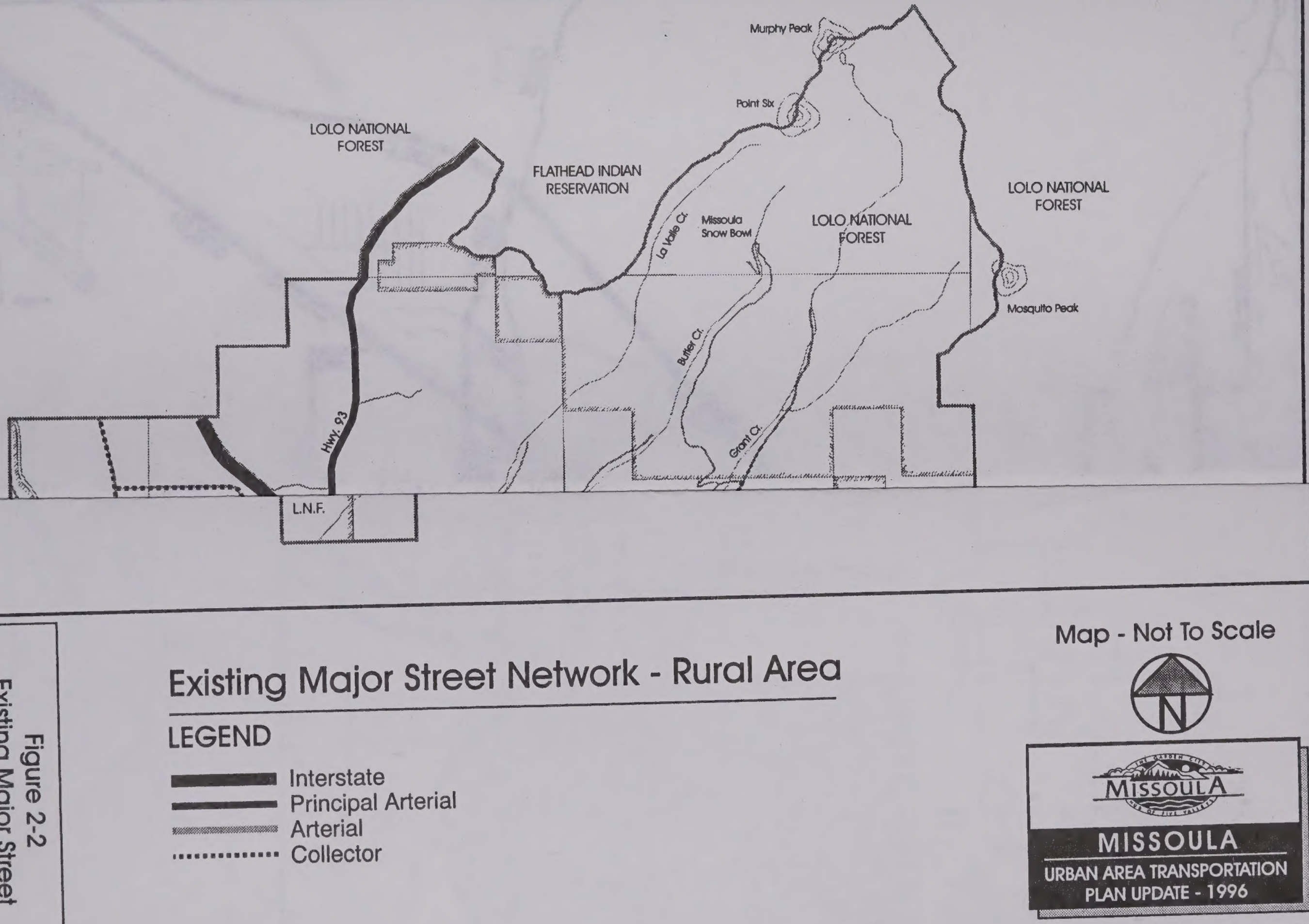

Figure 2-2
Existing Major Street
Network - Rural Area

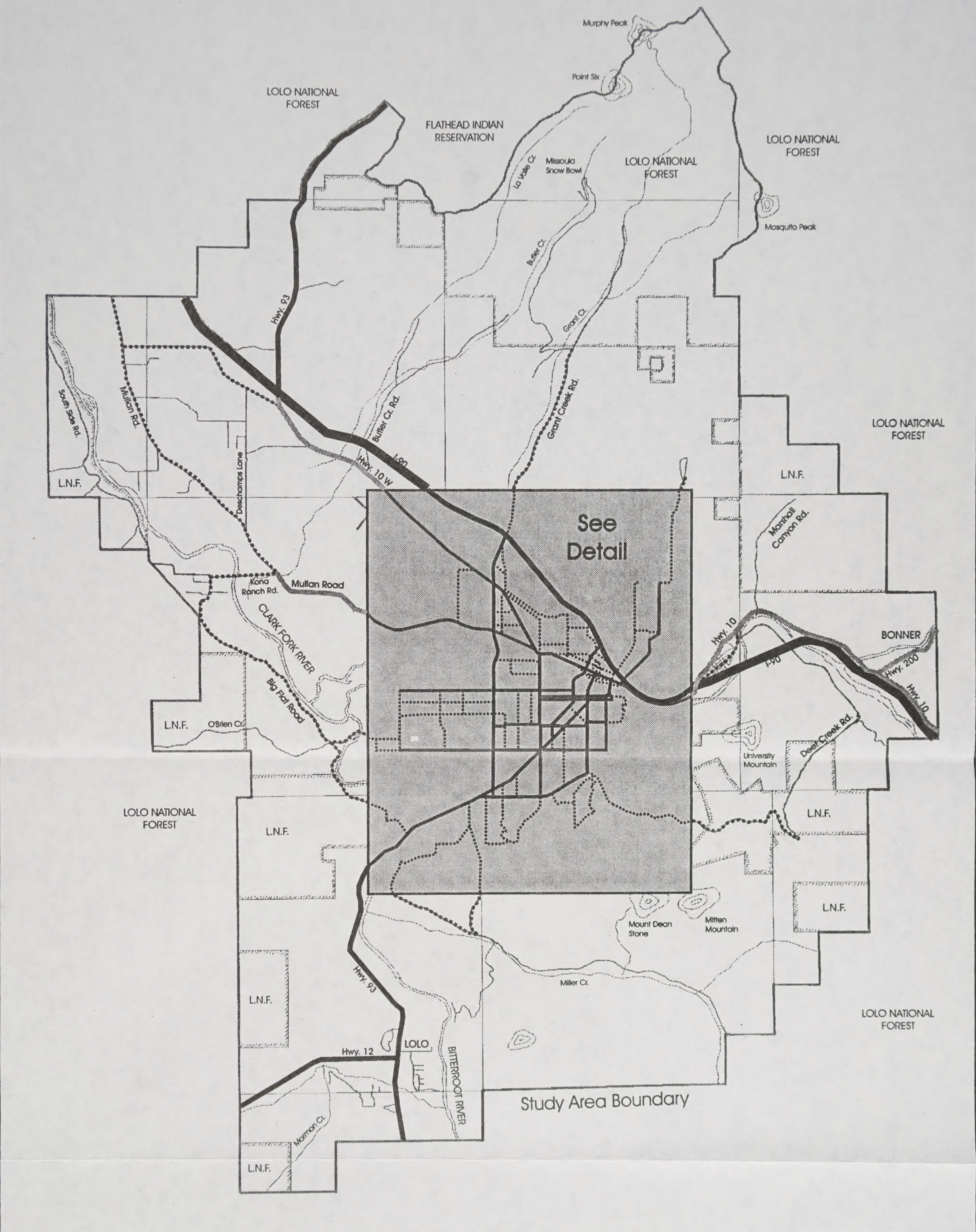

Figure 2-2
Existing Major Street Network - Rural Area

Existing Major Street Network - Rural Area

LEGEND

▬	Interstate
▬	Principal Arterial
▬	Arterial
⋯⋯	Collector

Map - Not To Scale

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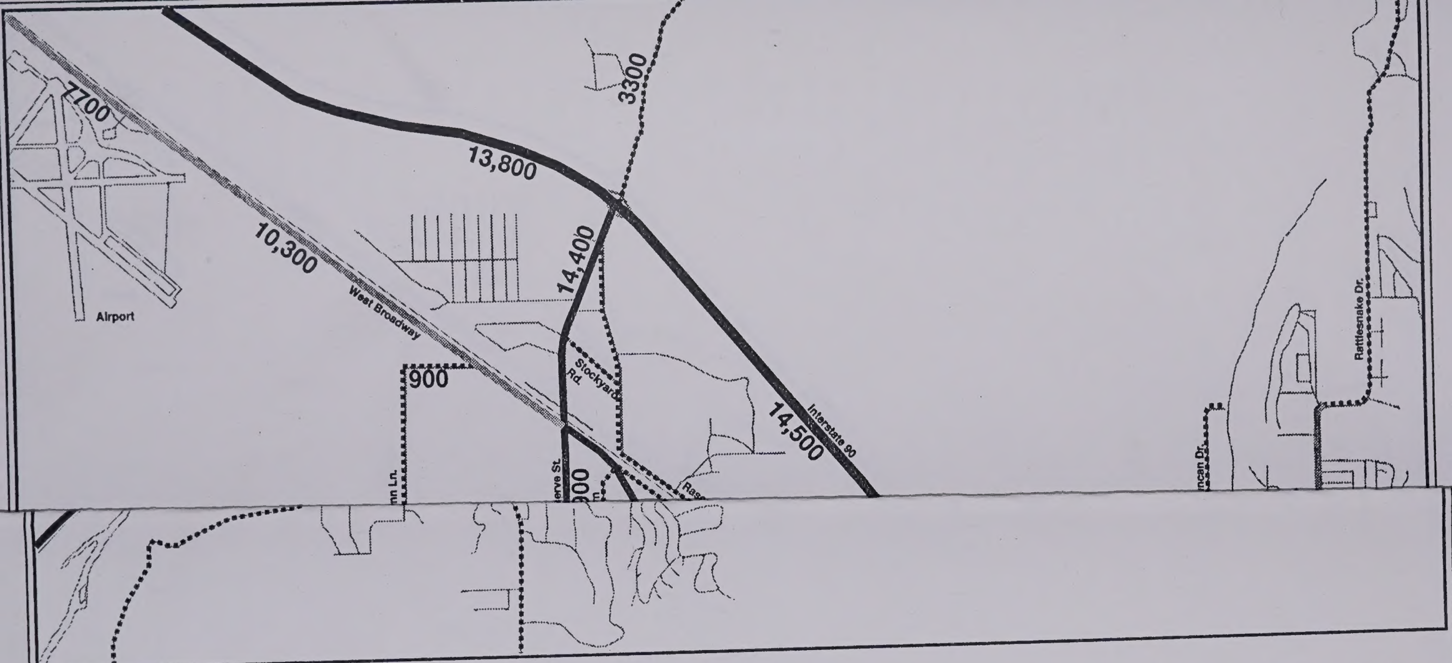
URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996



Existing Traffic Volumes (1994)

LEGEND

▬ Interstate
▬ Principal Arterial
▨ Arterial
.... Collector
13,200 Average Daily Traffic Volume

Map - Not To Scale

MISSOULA
URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996

Figure 2-3
Existing Traffic Volumes
(1994)

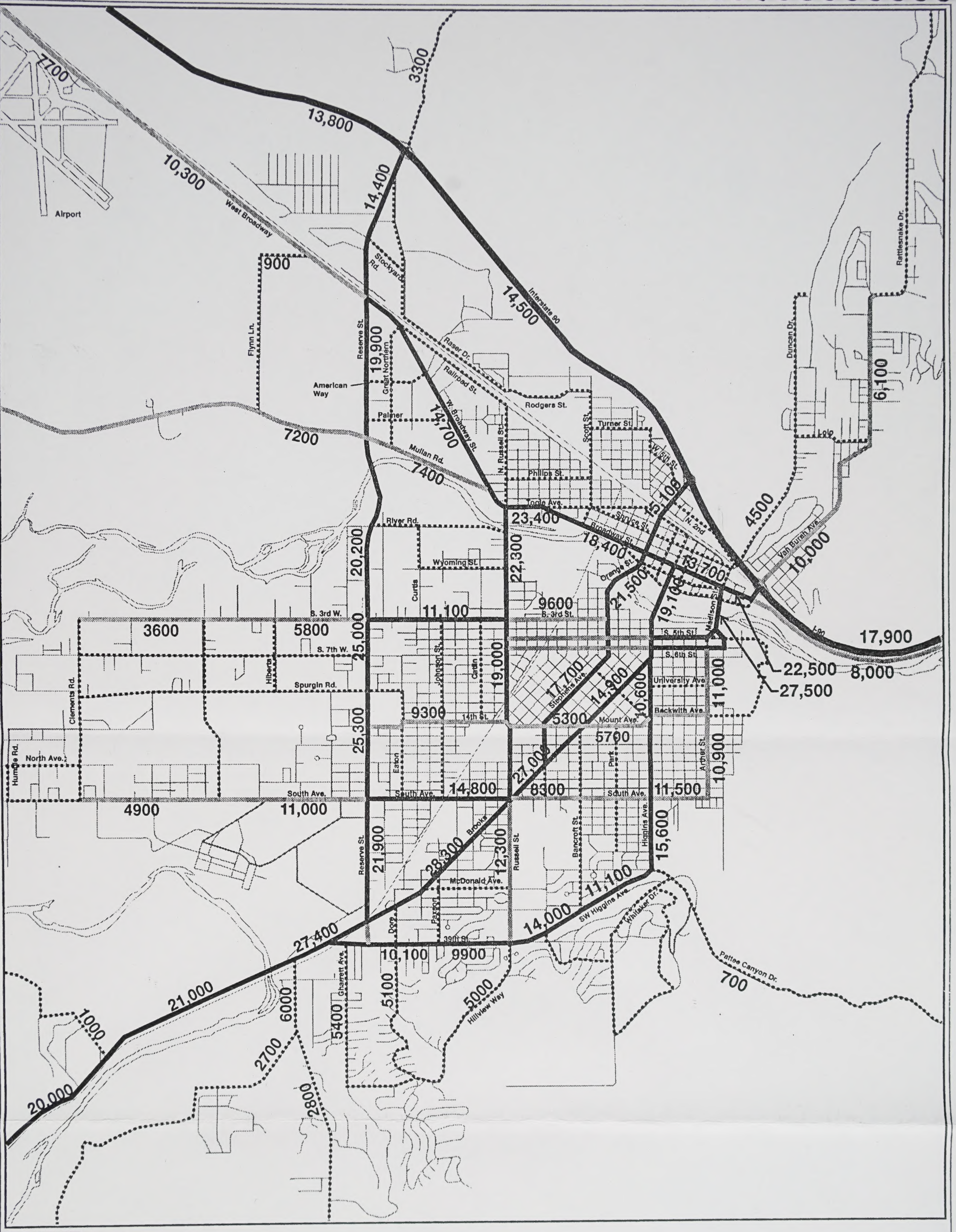


Figure 2-3
Existing Traffic Volumes
(1994)

Existing Traffic Volumes (1994)

LEGEND

- ▬ Interstate
- ▬ Principal Arterial
- ▬ Arterial
- ┅ Collector
- 13,200 Average Daily Traffic Volume

Map - Not To Scale

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URBAN AREA TRANSPORTATION PLAN UPDATE - 1996

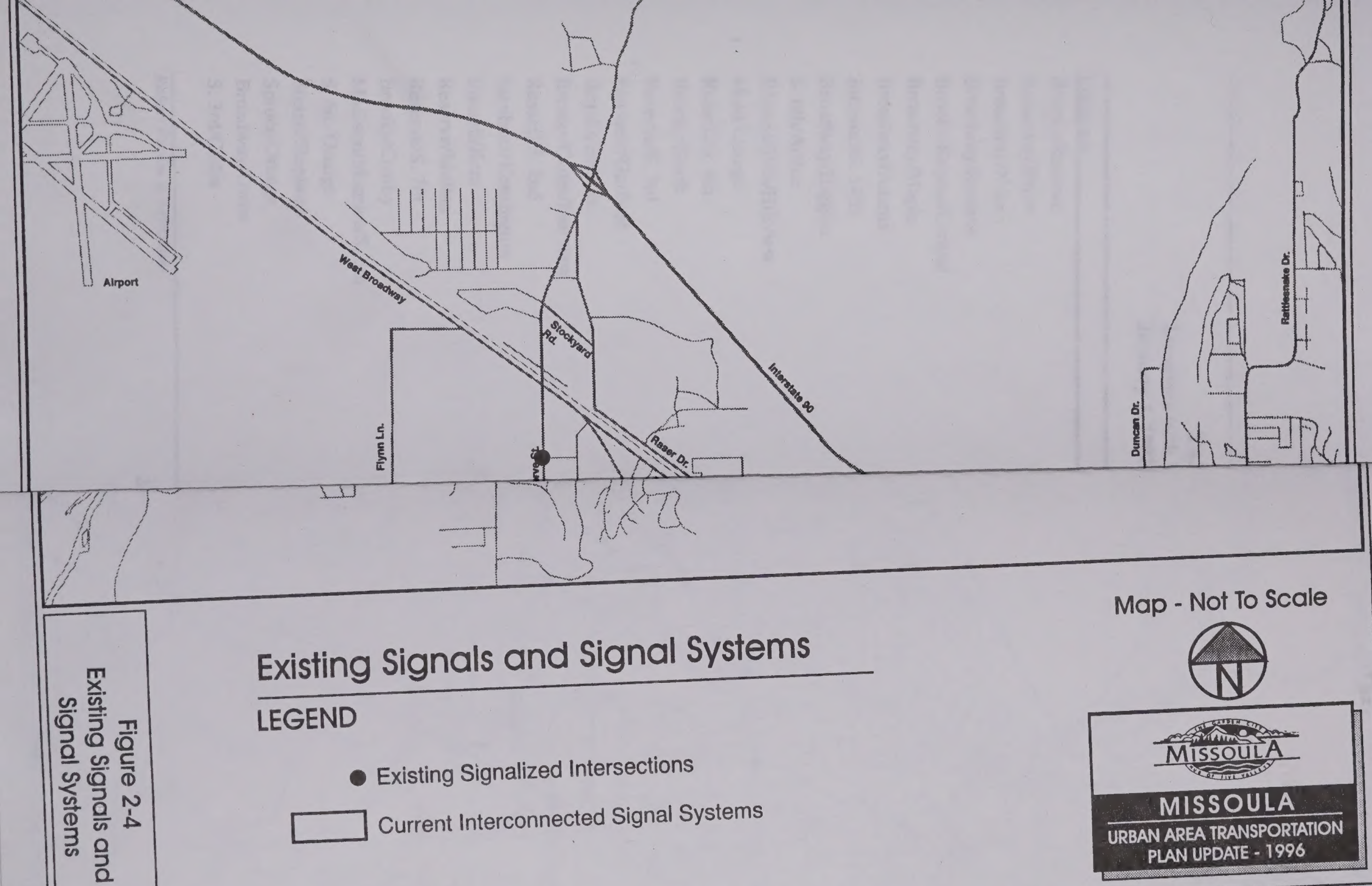
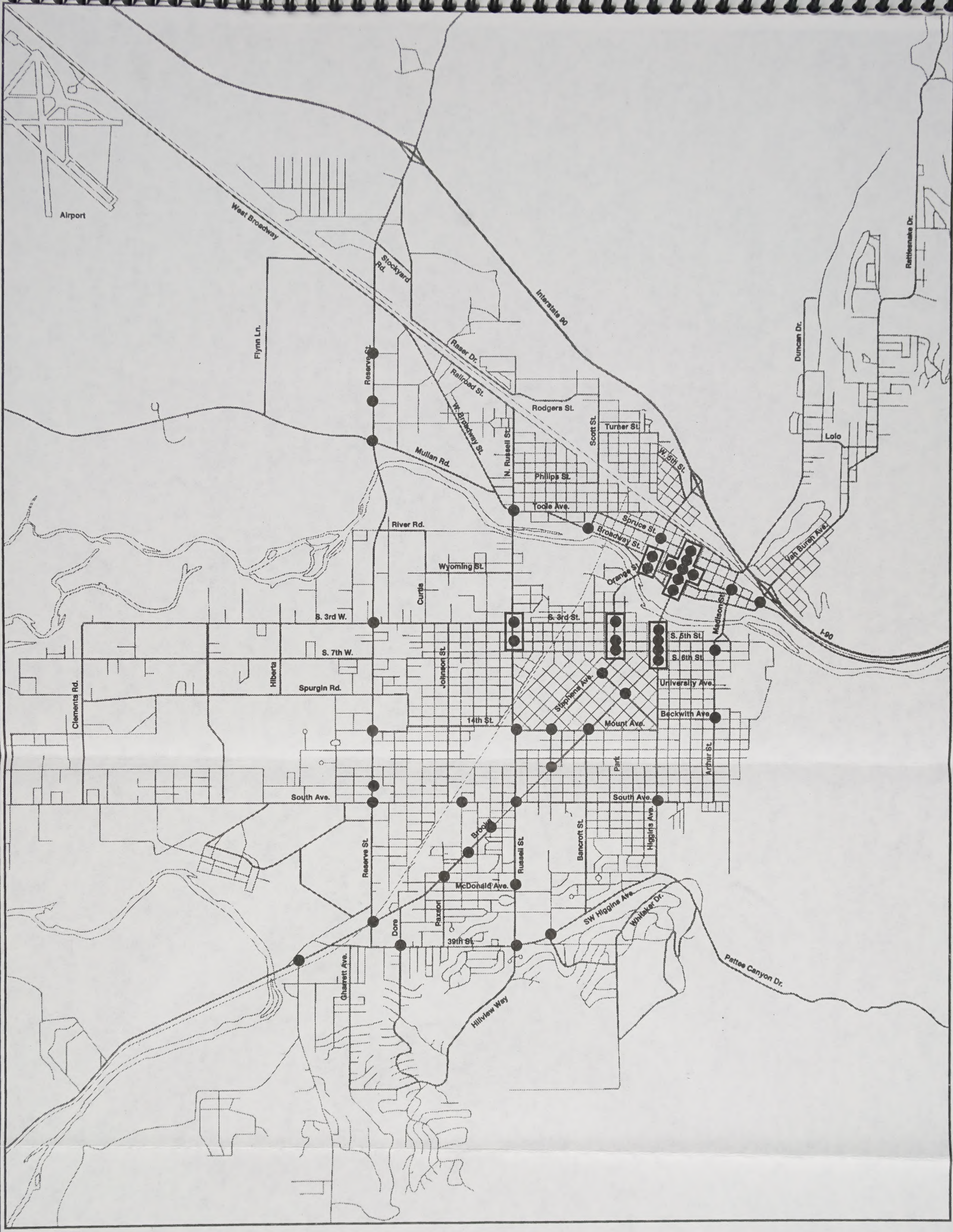


Figure 2-4
Existing Signals and
Signal Systems



Existing Signals and Signal Systems

LEGEND

● Existing Signalized Intersections

▭ Current Interconnected Signal Systems

Map - Not To Scale

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Figure 2-4
Existing Signals and
Signal Systems

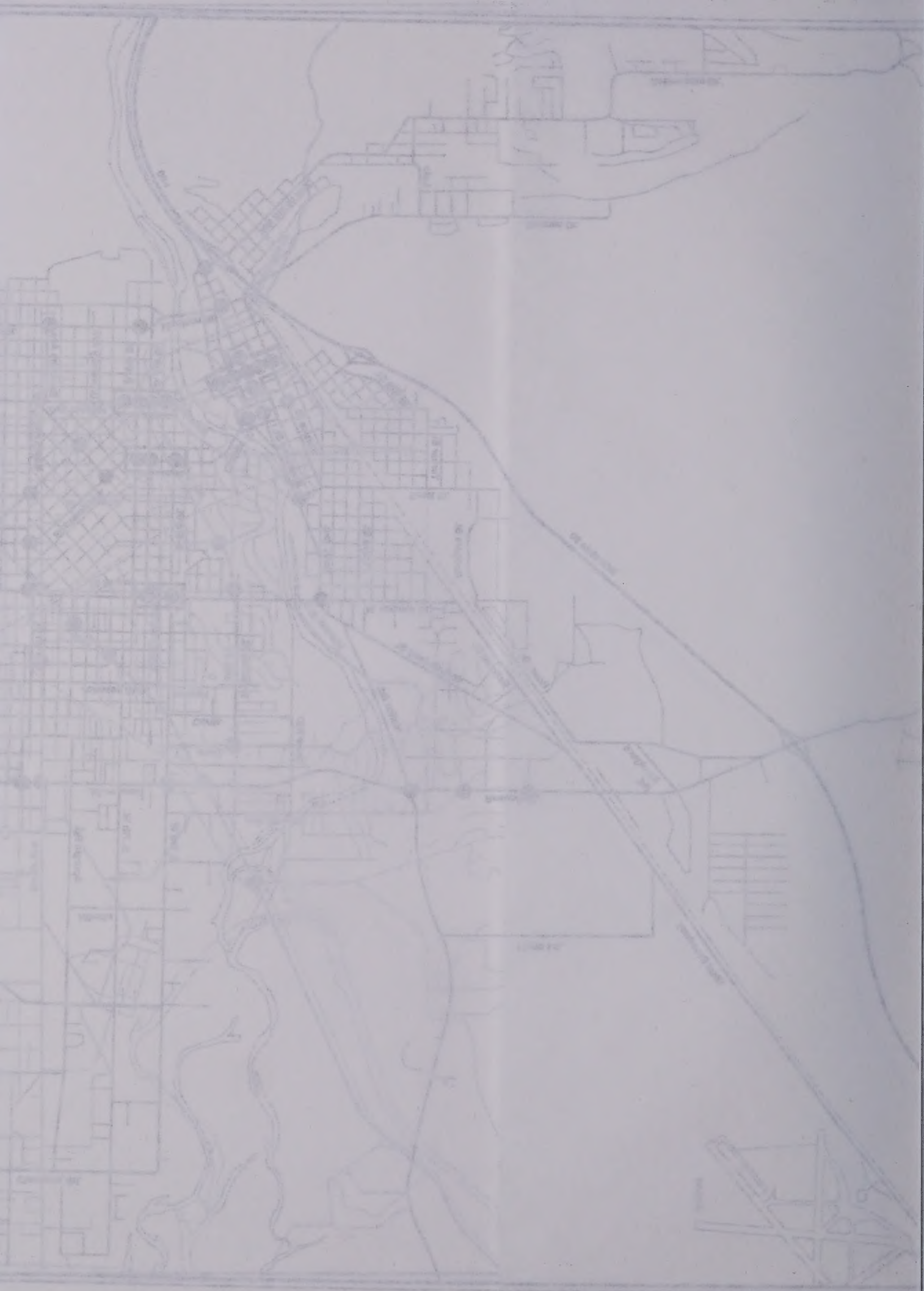
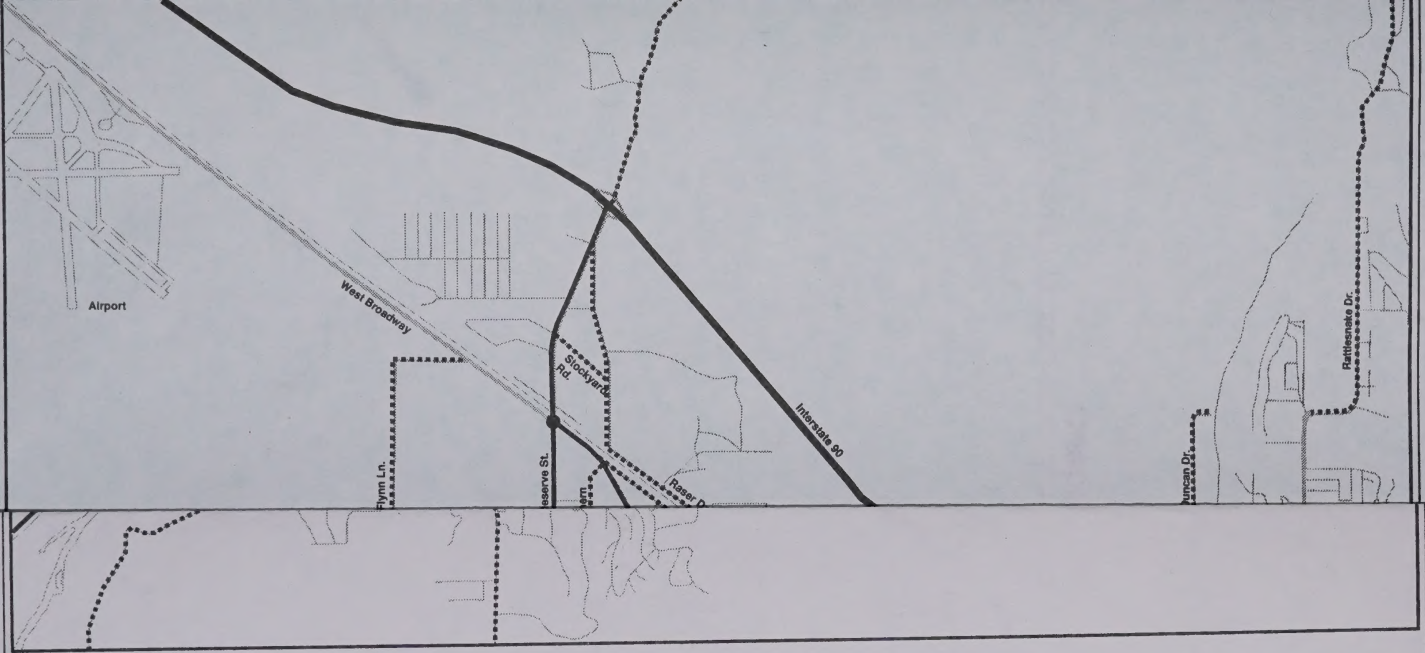


TABLE 2-1
Locations with High Accident Rates
January 1, 1992 - December 31,1995

Location	No. Of Accidents	Severity*
Brooks/Reserve	48	1.6
Broadway/Front	43	1.7
Broadway/Nora	43	1.6
Broadway/Reserve	37	1.6
Brooks/Regent/Central	36	1.7
Broadway/Maple	32	1.7
Broadway/Adams	30	1.7
Johnson/S. 14th	29	2.1
Broadway/Higgins	29	1.3
S. 6th/Arthur	28	1.8
Russell/39th/Hillview	26	2.1
Main/Orange	26	1.5
Russell/S. 4th	22	1.4
Brooks/North	22	1.4
Reserve/S. 3rd	20	1.5
Fairview/Garfield	20	1.4
Brooks/39th St.	20	1.8
Brooks/Catlin/Fairview	20	1.2
Russell/S. 2nd	19	1.8
Stephens/Kensington	19	1.3
Russell/Kent	18	1.3
Reserve/Mullan	17	1.7
Reserve/S. 7th	17	2.2
Brooks/Crosby	17	1.6
Madison/Maurice/S. 5th	17	1.4
S. 6th/Orange	16	1.9
Strand/Stephens	16	1.5
Spruce/Orange	16	2
Broadway/Owen	16	1.5
S. 3rd/Catlin	15	1.7

Location	No. Of Accidents	Severity*
Russell/S. 5th	15	1.4
Brooks/Dore	15	2.6
Brooks/Washburn/Dearborn	15	1.3
South/Higgins	14	2
Reserve/South	14	1.7
Brooks/Kent	14	1.6
S. 5th/Orange	13	1.9
S. 3rd/Russell	13	1.7
South/Stephens	13	1.9
South/Kemp St.	13	1.6
South/Catlin	13	1.9
Russell/North	13	1.2
Reserve/Dearborn	13	1.9
Higgins/S. 5th	13	1.5
39th/23rd/Dore	13	1.5
Brooks/Garfield	13	1.2
Broadway/May	13	1.8
S. 4th/Higgins	12	1.5
South/Grant	12	1.7
Daly/Gerald	12	1.3
Brooks/Paxson	12	1.7
Broadway/Palmer	12	2
S. 6th/Ronald	12	1.7

* Average accident severity is calculated using the following ratings:
1 = Property damage, 2 = Injury, 3 = Fatality



Accident Location Map

LEGEND

- ● Accident Location - 12 or More Accidents During 3 Year Period (1992 - 1994)
- Interstate
- Principal Arterial
- Arterial
- Collector

Map - Not To Scale

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Figure 2-6
Accident Location Map

Location	No. Of Accidents	Severity*
Russell/S. 5th	15	1.4
Brooks/Dore	15	2.6
Brooks/Washburn/Dearborn	15	1.3
South/Higgins	14	2
Reserve/South	14	1.7
Brooks/Kent	14	1.6
S. 5th/Orange	13	1.9
S. 3rd/Russell	13	1.7
South/Stephens	13	1.9
South/Kemp St.	13	1.6
South/Catlin	13	1.9
Russell/North	13	1.2
Reserve/Dearborn	13	1.9
Higgins/S. 5th	13	1.5
39th/23rd/Dore	13	1.5
Brooks/Garfield	13	1.2
Broadway/May	13	1.8
S. 4th/Higgins	12	1.5
South/Grant	12	1.7
Daly/Gerald	12	1.3
Brooks/Paxson	12	1.7
Broadway/Palmer	12	2
S. 6th/Ronald	12	1.7

* Average accident severity is calculated using the following ratings:
1 = Property damage, 2 = Injury, 3 = Fatality

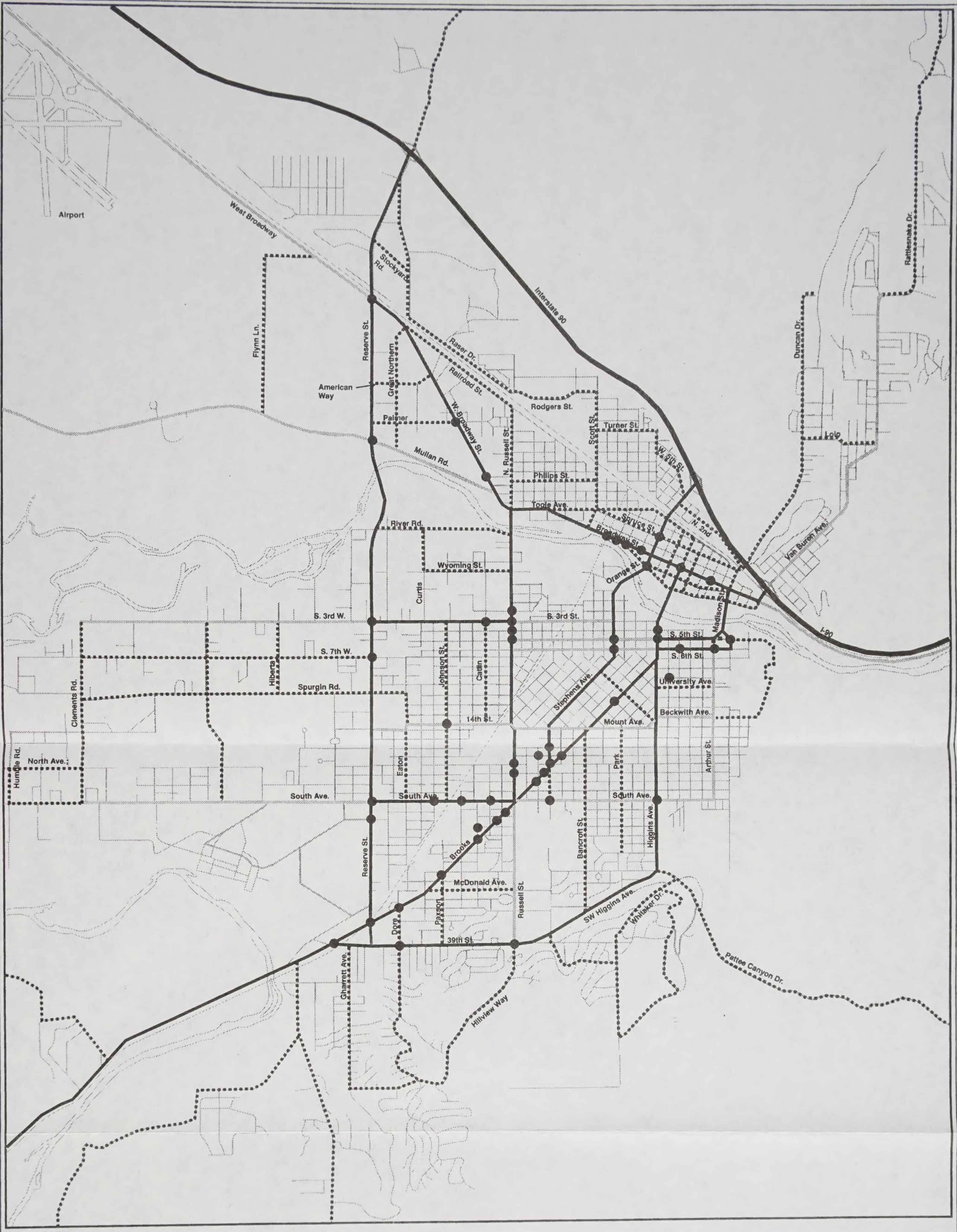

Figure 2-6
Accident Location Map

Accident Location Map

LEGEND

- ● Accident Location - 12 or More Accidents During 3 Year Period (1992 - 1994)
- Interstate
- Principal Arterial
- Arterial
- Collector

Map - Not To Scale

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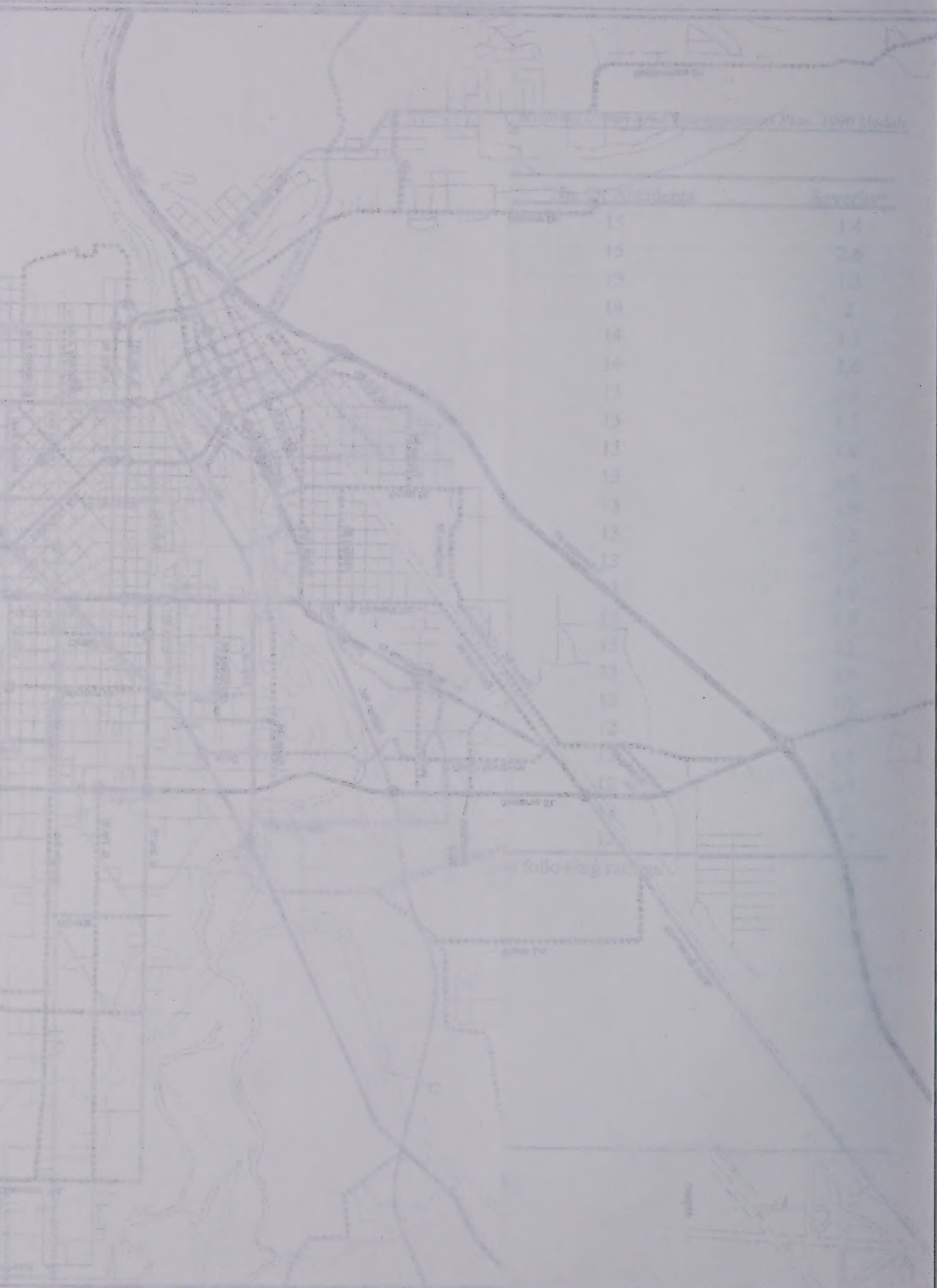


Chapter 3: Bicycle System Analysis

3.0 Bicycle System Analysis

3.1 Existing Facilities

Missoula is thought of as Montana's bicycling town. Traditionally, bicyclists in Missoula have ridden on the outside lane of the road. Therefore, a designated bicycle infrastructure system is almost non-existent. Consequently, bicyclists today have no choice but to share the road with a growing number of automobiles.

It is not unusual to see 50 to 100 bicycles parked in and around each of Missoula's grade schools. Considering the lack of designated bike lanes and bike paths it is reasonable to assume that children are riding to school on sidewalks, road shoulders, or in traffic lanes. This situation poses safety risks to these young bicyclists.

It is recommended that a cohesive network of bicycle facilities be developed to accommodate the safe and efficient travel of bicyclists in the Missoula Urbanized Area. Several citizen action groups have been working toward this goal, and the recommendations contained in this Transportation Plan include provisions for bicycle facilities on all new construction on the major street network.

3.2 Current Activity

Most destinations within the City of Missoula can be reached on a bicycle in less than thirty minutes. The speed and flexibility of bicycle travel make it a viable alternative to the single-occupant vehicle. Public transit service in Missoula offers comparable travel times to major destinations, but has disadvantages such as 30-minute headways and limited service schedules. Since the majority of trips in the Missoula Area are less than five miles one-way, there is significant potential for increased bicycle travel.

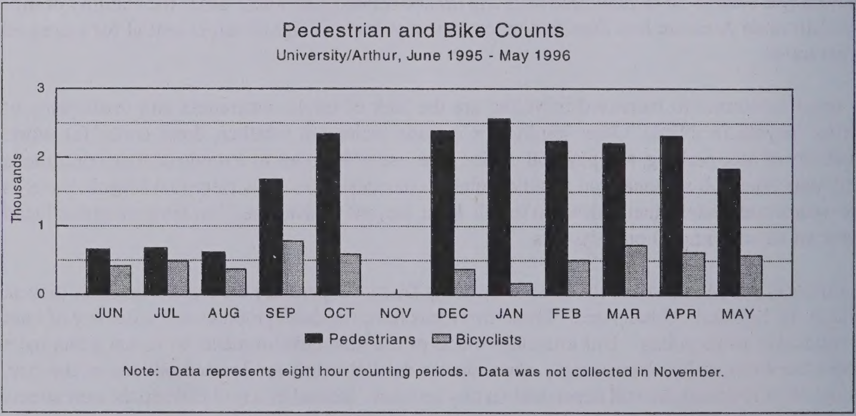
The main deterrents to increased bicycling are the lack of public awareness and inadequacy of existing bicycle facilities. Other hindrances include inclement weather, dress codes for work, availability of bike parking, and physical ability. The use of bicycles as a mode of transportation is highly dependent on seasonal and weather-related considerations. It is clear that bicycle travel is more weather dependent than pedestrian travel. Rain, ice, snow, wind, and low temperatures all tend to have an adverse impact on bicyclists.

The University of Montana and the Central Business District experience the highest levels of bicycle traffic in the Missoula Urban Area. These two areas have the demographics and a density of land use conducive to bicycling. Unfortunately much of the new developments in recent years have favored the automobile. Increasingly, these newer developments are located outside of the city, although their residents are still dependent on city services. Instead of a grid pattern, the new streets are characterized by non-linear patterns, cul-de-sacs, large lots and an absence of sidewalks. Because these developments typically contain only homes, their residents are dependent on the few roads that link them to shopping malls, work sites, schools and churches, which are often many miles away. Bicycle use rates in new developments are much lower than in areas with a more traditional city layout.

Bike counts were conducted twice monthly from June 1995 to May 1996 at the intersection of University and Arthur Avenues, and on the Higgins Avenue bridge. These locations were chosen to provide a representative sample of bicycle activity in the University area and the Central Business District, respectively.

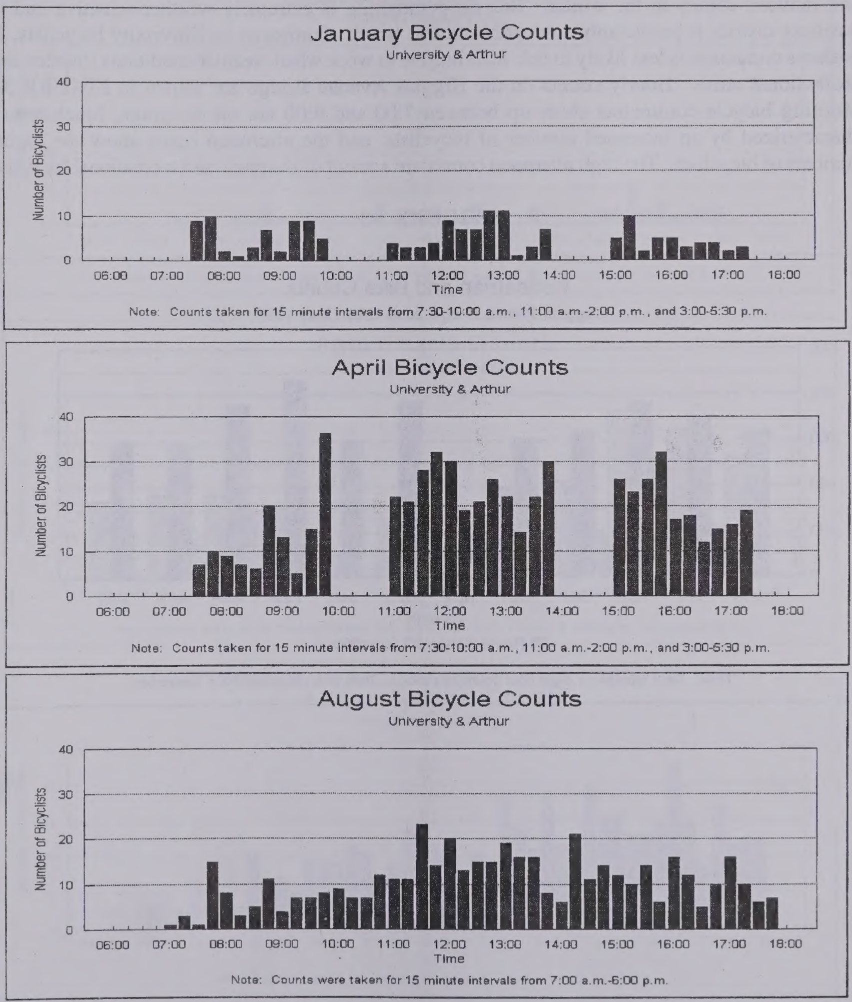
FIGURE 3-1 summarizes monthly bike counts at the University/Arthur intersection. The fact that the lowest bicycle count occurs in January is expected, supporting the assumption that bicycle riding is very weather sensitive. This graph also shows an increase in pedestrian counts when bicycle activity is down. During January, weather and road conditions forced bicyclists off their bicycles and onto sidewalks as pedestrians. Low bicycle counts at this location during the summer months are the result of college students leaving town during this time. **FIGURE 3-2** contains a sampling of the hourly bicycle counts collected at the intersection of University and Arthur. This data indicates a fairly consistent number of bicyclists during the morning and evening commuting hours. There is also a fair amount of bicycle traffic during the noon hour. University-related bicycle travel appears to be less sensitive to weather conditions than bicycle travel occurring in the Central Business District.

FIGURE 3-1



Note: Data represents eight hour counting periods. Data was not collected in November.

FIGURE 3-2



January Bicycle Counts

University & Arthur

Note: Counts taken for 15 minute intervals from 7:30-10:00 a.m., 11:00 a.m.-2:00 p.m., and 3:00-5:30 p.m.

April Bicycle Counts

University & Arthur

Note: Counts taken for 15 minute intervals from 7:30-10:00 a.m., 11:00 a.m.-2:00 p.m., and 3:00-5:30 p.m.

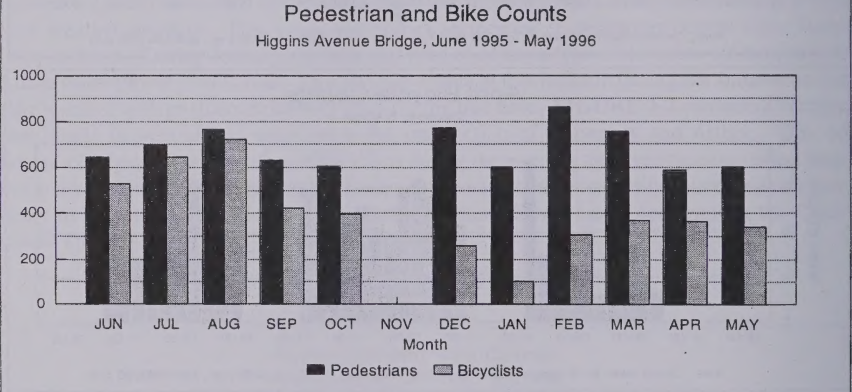
August Bicycle Counts

University & Arthur

Note: Counts were taken for 15 minute intervals from 7:00 a.m.-6:00 p.m.

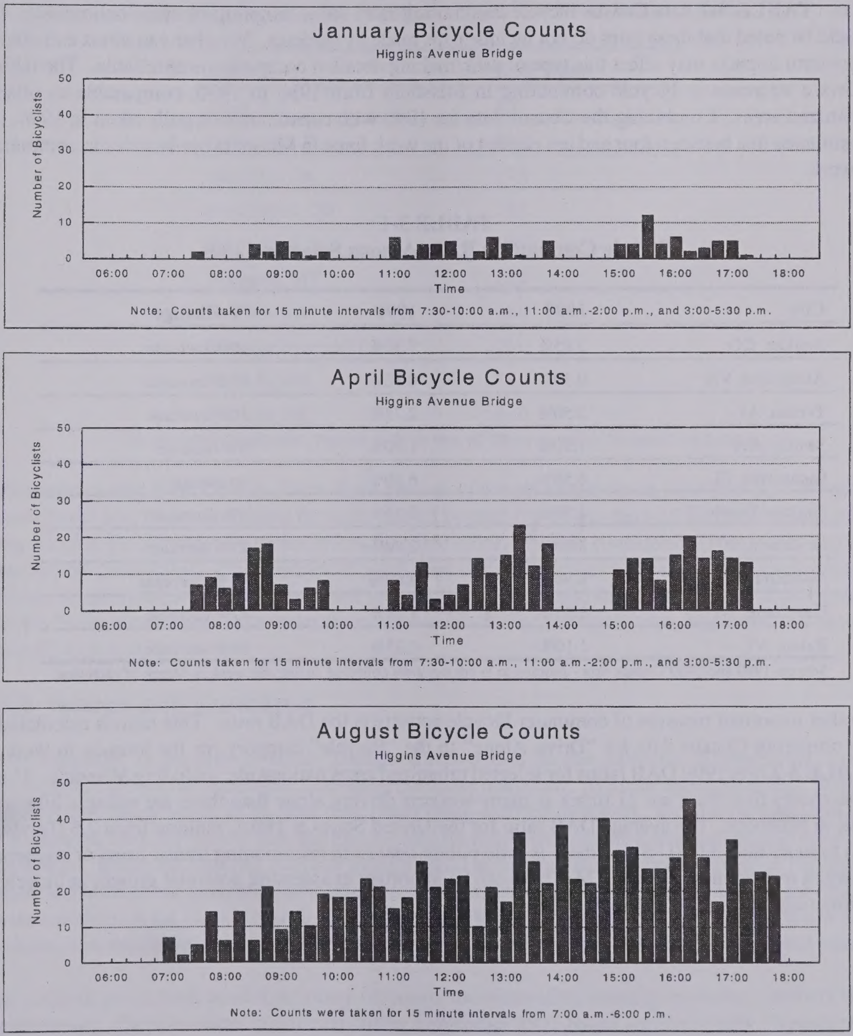
FIGURE 3-3 summarizes monthly bicycle counts in the downtown (CBD) area. This graph demonstrates expected seasonal patterns with high levels of bicycle activity during summer months, and reduced counts in the winter. Bicycle commuting is extremely weather-sensitive and the business district is predictably susceptible to this trend. Compared to University bicyclists, the business commuter is less likely to ride their bicycle to work when weather conditions threaten their professional attire. Hourly counts on the Higgins Avenue Bridge are shown in **FIGURE 3-4**. Morning bicycle commuters show up between 7:00 and 9:00 am on the graph, lunch hour is characterized by an increased number of bicyclists, and the afternoon hours show the highest numbers of bicyclists. The high afternoon counts are a result of shoppers and recreational bicyclists.

FIGURE 3-3



Note: Data represents eight hour counting periods. Data was not collected in November.

FIGURE 3-4



January Bicycle Counts

Higgins Avenue Bridge

Note: Counts taken for 15 minute intervals from 7:30-10:00 a.m., 11:00 a.m.-2:00 p.m., and 3:00-5:30 p.m.

April Bicycle Counts

Higgins Avenue Bridge

Note: Counts taken for 15 minute intervals from 7:30-10:00 a.m., 11:00 a.m.-2:00 p.m., and 3:00-5:30 p.m.

August Bicycle Counts

Higgins Avenue Bridge

Note: Counts were taken for 15 minute intervals from 7:00 a.m.-6:00 p.m.

Comparison of Census data can be useful in identifying general trends in bicycle commuter travel rates. **TABLE 3-1** lists Census bicycle commuting rates for a sampling of cities nationwide. It should be noted that these rates do not include trips made by students. Weather variations and other short-term impacts may affect this type of data, making detailed comparisons unreliable. The table shows a decrease in bicycle commuting in Missoula from 1980 to 1990, comparable to other urbanized areas. Combining the Census data for 1990 with consultant exit polls taken in 1994, it is estimated that between four and ten percent of the work force in Missoula use bicycles to commute to work.

TABLE 3-1
Bicycle Commuting Rates Among Selected Cities

City	1980	1990	% Change
Boulder, CO	3.85%	7.30%	90% increase
Alexandria, VA	0.30%	0.50%	67% increase
Tucson, AZ	2.50%	2.75%	10% increase
Seattle, WA	1.30%	1.40%	8% increase
Gainesville, FL	6.50%	6.50%	no change
Daytona Beach, FL	2.50%	2.35%	6% decrease
La Crosse, WI	3.30%	2.40%	27% decrease
Missoula, MT	**6.80%**	**4.00%**	**41% decrease**
Eau Claire, WI	1.85%	1.08%	42% decrease
Beloit, WI	1.10%	0.37%	66% decrease

Source: 1980 and 1990 Census data - Journey to Work numbers collected during one week in March of each year.

Another important measure of commuter bicycle activity is the DAB ratio. This ratio is calculated by comparing Census data for "Drive Alone" to the "Bicycle" category for the journey to work. **TABLE 3-2** lists 1990 DAB ratios for selected urbanized areas nationwide, including Missoula. The table shows that there are 21 times as many workers driving alone than there are riding a bike to work in Missoula. The average DAB ratio for the United States is 180.4, ranging from 2.5 (Davis, CA) to more than 3,000. Since there is little public benefit in encouraging transit users or walkers to switch over to bicycling, the DAB ratio can be important in assessing potential growth in bicycle commuting.

TABLE 3-2
Ratio of Drive Alone to Bicycle Trips to Work - Urbanized Areas

City	DAB Ratio
Davis, CA	2.5
Gainesville, FL	13.0
Palo Alto, CA	13.0
Fort Collins, CO	18.3
Eugene, OR	18.4
Missoula, MT	**21.2**
San Jose, CA	52.0
Montana (statewide)	78.0
Santa Fe, NM	78.9
Portland, OR	99.0

Source: 1990 Census data - Journey to Work ratio of "Drive Alone" to "Bicycle" categories.

According to the 1990 Census, thirty-three percent of people employed in the Missoula Urbanized Area travel less than ten minutes to work, and 63 percent travel less than 15 minutes. Trips under ten minutes for motorists are typically less than five miles, which is considered a reasonable distance for bicycle commuting. If ten percent of work trips under five miles were made on bicycle instead of in a single-occupant vehicle, the DAB ratio for Missoula would decrease to 12.1. If ten percent of the "drive alone" work trips under six miles were converted to bicycle trips, Missoula's DAB ratio would drop to 8.4.

3.3 Issues and Concerns

For bicycling to become a viable transportation option in the Missoula Urban Area, major destinations need to be accessible, and travel corridors made safe, pleasant and convenient. Routes that require many stops, or are less direct than those used by motorists, will not be fully utilized. Meeting the needs of both novice and experienced bicyclists will require expanded on- and off-street facilities. While the existing roadway system could accommodate the vast majority of bicyclists, there is a widespread perception among current and "would-be" cyclists that most roads are neither safe nor pleasant for bicycle travel. High speeds and high numbers of motor vehicles, narrow lane widths, and road debris are some of the conditions which can make bicycling frustrating and unsafe.

In order to avoid such conditions many bicyclists use sidewalks, creating increased conflicts with pedestrians. Bicycle counts conducted during September 1995 found approximately 15 percent of observed bicycle activity occurring on sidewalks. The use of sidewalks increases a bicyclist's vulnerability at intersections and driveways because of sight restrictions and the unpredictability of vehicle traffic at these locations.

A study documented in *Pro Bike News* (June 1993 issue) showed a direct correlation between the existence of designated bike facilities and use rates in Corvallis, OR. The simple marking (striping and signing) of a bike lane on an existing wide travel lane may more than double the bicycle use rate. There is a strong perception that bicycling is not safe without such facilities.

According to police records, two percent of all reported accidents in Missoula during the three year period 1992-1994 involved bicyclists. **TABLE 3-3** lists accidents involving bicycles from 1992 through 1994. The table shows a steady increase in the number of bicycle accidents reported each year. Without corresponding bicycle count data, it is impossible to know if the increase in accidents reflects an increase in bicycling activity or if it is indicative of worsening conditions.

TABLE 3-3
Reported Accidents Involving Bicyclists

Year	Number of Accidents
1992	22
1993	27
1994	34

While bicycle counts indicate that there are about twice as many adults as youth cycling in Missoula, young bicyclists are involved in nearly as many reported accidents as adult bike riders. The 10-13 year-old age group accounts for 20 percent of the bicycle accident victims. This is in contrast to the estimate that this group only constitutes between five and six percent of the bicycle-aged population in the Missoula area.

Several national studies show that cyclists wearing helmets have about the same chance of being fatally injured as a driver of an automobile for the same amount of time spent at either activity. Children and novice cyclists are considered to be at higher risk. This acknowledged risk underscores the need for comprehensive safety programming, enforcement, helmet promotion campaigns and better bicycle facilities.

Availability of safe parking places for bikes is another concern of cyclists. Fifteen percent of bicyclists surveyed in the 1992 Downtown Missoula Commuter Survey reported that it was difficult to park their bicycles safely in downtown Missoula, 38 percent found it to be moderately difficult, and 46 percent thought it was easy to find safe parking spots.

3.4 Needs Assessment

The following needs have been identified for bicycle facilities in the Missoula Urban Area:

- The arterial road network needs to be retrofited to accommodate bicycle travel, or adjacent streets need to be designated as bicycle commuter routes;
- Community awareness of the bicycle as an alternative to vehicle travel need to be heightened;
- New bicycle facilities need to be developed and "highlighted" using the media and other methods to heighten public awareness and encourage increased bicycle use;
- Overall bicycle safety needs to be improved;
- Corridor lighting is needed to improve safety for wintertime bicycle commuters;
- Adequate bicycle storage facilities at workplaces, schools and multifamily residences is needed;
- A balance between the existing road system and bicycle infrastructure needs to be promoted;
- Neighborhoods need to be protected from commuter traffic that strays from arterials in search of more efficient travel routes;
- Bicycle education programs need to be developed and made available to all age groups;
- Barriers that prohibit bicycle travel need to be removed;
- Bicycle-friendly design amenities need to be included in all new development;
- Bicycle travel needs to be promoted as healthy for the rider and the community;
- Bicycle facilities need to be maintained - keep bike storage areas in good repair and bike lanes clear of snow and debris;
- More off-road bike trails are needed.
- Facilities and programs should target the 10-13 year old age group since they represent the most accident-prone portion of the bicycling population.

3.5 Recommendations

Project Recommendations

A wide variety of recommended projects included in this Transportation Plan Update include bicycle facilities and improvements. Approximately twenty-two percent of the estimated cost of all transportation recommendations for the Missoula Urban Area is designated for development of bicycle and pedestrian facilities. This is a relatively high percentage compared to transportation planning documents for other urbanized areas in Montana and the rest of the United States. **FIGURE 3-5** shows the recommended bicycle facility improvements included on approximately 70 corridor miles throughout the study area.

Bicycle lanes that do not require road widening should be installed as soon as practical. The construction of separate bike paths and newly constructed bike lanes will be more expensive and take more planning time. Many of these bicycle improvement projects are associated with larger road improvement projects. In these cases the planning of the bicycle facility improvements should occur at the same time as the adjacent road improvement projects.

Program Recommendations

It is recommended that the community begin implementing each of the following programs as soon as practical:

1. Develop an complete bikeway system consisting of networked routes, bike lanes and paths;
2. Include bicycle facilities in plans for any new road improvement or development;
3. Implement and adopt a non-motorized trail network for recreational bicycling and other activities;
4. Provide short-cuts for bicyclists wherever possible by developing paths beyond dead-end roads and across railroad tracks and other barriers;
5. Discourage use of sidewalks as bike paths;
6. Design or redesign arterials and collectors to accommodate bicycles; where existing arterials cannot safely accommodate bicyclists and improvements would be cost-prohibitive, adjacent streets should be identified and marked as bicycle routes;
7. Begin a bike route signing program;
8. Provide adequate facilities for bicycle parking a public buildings and retail areas;
9. Ensure that new commercial developments, apartment complexes and employers provide bicycle parking facilities through the site review process or a zoning ordinance;
10. Install and lease up to ten bike lockers at major destinations in Missoula;
11. Ensure that all bicycle facilities are inspected and maintained on a regular basis;
12. All bicycle traffic control signs, pavement markings and signals should conform to the Manual on Uniform Traffic Control Devices (MUTCD);

13. Continue a public relations program encouraging alternatives to automobile travel and reminding road users that "streets are for everyone";

14. Review the need to adjust signal timing at problem intersections for safe bicycle crossings;

15. Demand-actuated signals should respond to the presence of bicycles;

16. Install Stop or Yield signs on low-volume residential streets that intersect with bicycle routes in order to reduce the number of uncontrolled intersections where bicycling is common;

17. Increase sight distance at bicycle crossings by signing and striping no parking zones within 50 feet of any intersection;

18. Mark shoulder lines on rural roads wherever feasible (based on 12-foot travel lanes); where shoulders are four feet wide or greater, consider marking them as bike lanes;

19. Re-stripe four-lane arterial streets to provide wider curb lanes, if no designated bike lanes, as part of any new overlay or improvement project;

20. Provide appropriate signing and pavement markings where bike lanes are established;

21. Ensure that the needs of bicyclists are considered in new developments;

22. Continue to implement safety education programs in elementary schools;

23. Work with the University to provide new student orientation on bicycle safety; enlist an Effective Cycling Instructor to teach at least one course on safe cycling skills;

24. Update the Missoula Bike Map on a continuous basis to include new bicycle routes and facilities; make current copies of this map available at all bike shops and public buildings;

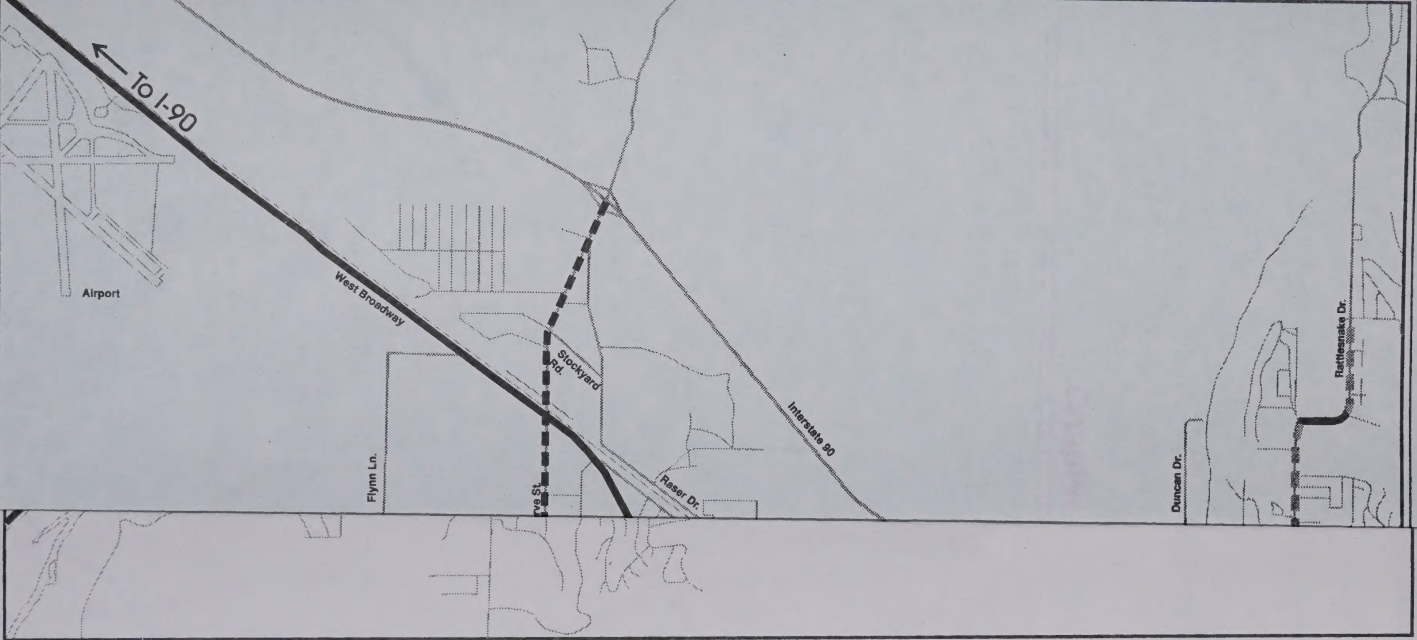
25. Implement a comprehensive law enforcement program to protect the rights and enforce the responsibilities of all road users;

26. Continue supporting the use of police officers on bikes for both regular patrol and bicycle traffic law enforcement;

27. Increase awareness about the rights and responsibilities of bicyclists using techniques such as PSA's, brochures inserted in drivers manuals, signs on roadways and involvement in driver's education classes;

28. Advertise the availability of bike racks on public transit buses;

29. Consider using visionary goals and new approaches to capture media and public attention for the purpose of furthering the goals of the Transportation Plan.



Recommended Bicycle Facility Improvements

LEGEND
15' Wide Outside Lanes
14' Wide Outside Lanes
Possible to Add Bike Lanes If Parking is Removed From One Side Of Street
Add Bike Lanes With Future Road Projects
Off Road Trails
Map - Not To Scale
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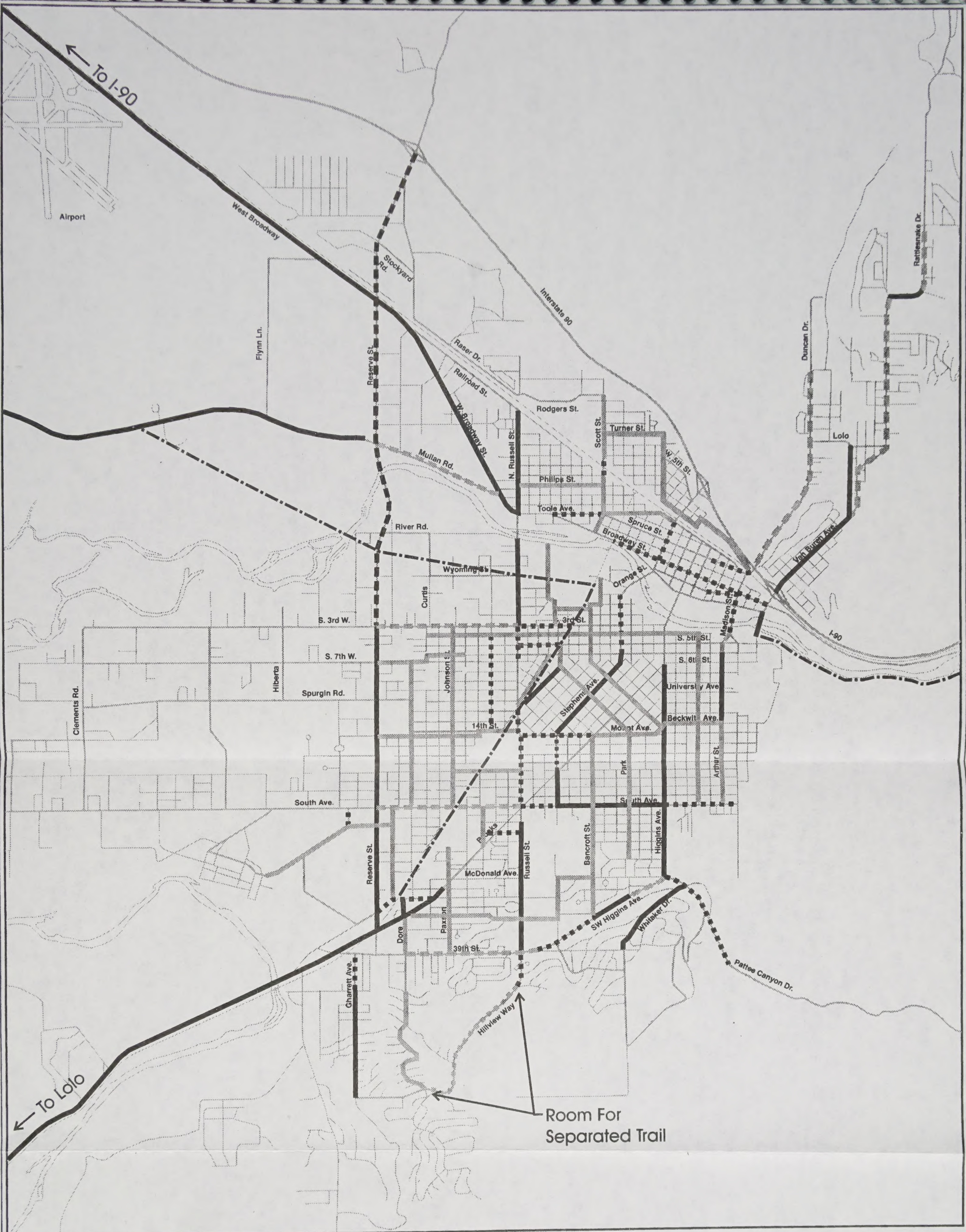
Figure 3-5
Recommended Bicycle
Facility Improvements

28. Advertise the availability of bike racks on public transit buses;

29. Consider using visionary goals and new approaches to capture media and public attention for the purpose of furthering the goals of the Transportation Plan.



Recommended Bicycle Facility Improvements

LEGEND

- 15' Wide Outside Lanes
- 14' Wide Outside Lanes
- Possible to Add Bike Lanes If Parking is Removed From One Side Of Street
- Add Bike Lanes With Future Road Projects
- Off Road Trails

Map - Not To Scale

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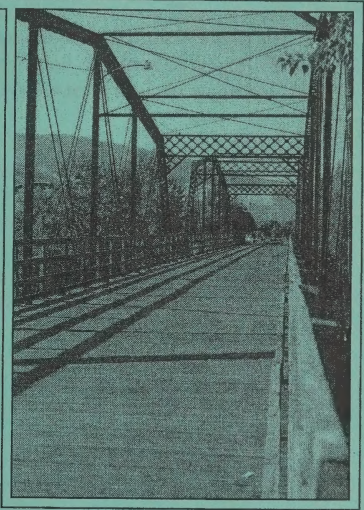
Figure 3-5
Recommended Bicycle
Facility Improvements

Chapter 4: Pedestrian System Analysis



4.0 Pedestrian System Analysis

4.1 Existing Facilities

Despite the fact that the City of Missoula and its surrounding communities all have policies to build sidewalks on one or both sides of the streets in residential and commercial areas, numerous locations remain where sidewalks are non-existent or intermittent. **FIGURE 4-1** illustrates the percent of blockfaces with sidewalks in various neighborhoods in the Missoula Urban Area. This percentage ranges from zero in the "Blue Mountain" area to 93 percent in the University area. The inconsistent nature of sidewalk availability is often a function of changing planning requirements which were in effect when each area was developed. It is also a function of the natural evolution of neighborhoods that were initially developed outside the City Limits and through annexation are now within the City Limits.

The manual *Guidelines For Creating a Non-Motorized Travel Network in the Greater Missoula Area* summarizes existing conditions in the following statement: "One of the repeated themes heard throughout the planning process was that sidewalks and pedestrian facilities are lacking or in need of repair throughout Missoula. In many areas, one must walk on the street with traffic because sidewalks or paved shoulders do not exist. In other areas, a sidewalk or shoulder may exist in one block, and not in the next. This stop and start nature of sidewalk hinders pedestrian travel."

The elderly and the young (those under legal driving age) are the most dependent on a community's pedestrian facilities, and the sidewalk system should be designed to meet their needs. Neighborhood sidewalks currently in place provide safe travel ways for children to walk to school, as well as walkways for the elderly in the Missoula Urban Area. It seems reasonable to assume that a comprehensive sidewalk network would make pedestrian travel safer and encourage more people to choose walking as an alternative mode of transportation. Special attention should also be given to improving pedestrian facilities within a quarter mile of a transit line.

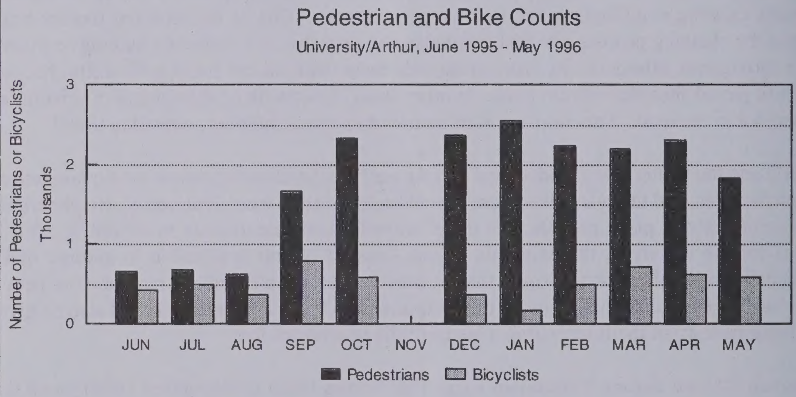
The *Missoula Citizens Survey* (Consultant's Exit Poll Survey taken in November 1994) found that if substantial improvements were made to pedestrian facilities, 20 percent of respondents would start walking two or three days a week as an alternative to driving, 15 percent would walk four or more days a week, and ten percent would walk one day a week.

4.2 Current Activity

Walking for transportation purposes is more common in the Missoula Urban Area than bicycling, and various efforts have been made to accommodate this nearly universal activity. Motorists and bicyclists walk from their parked vehicles to a building; transit users generally walk to a bus stop; many children walk to school, and to the homes of friends or other play areas. In addition, many people use paths such as the Kim Williams Trail along the Clark Fork River for exercise and pleasure walking. It is estimated that in the City of Missoula, eight percent of workers and 25 percent of students commute on foot.

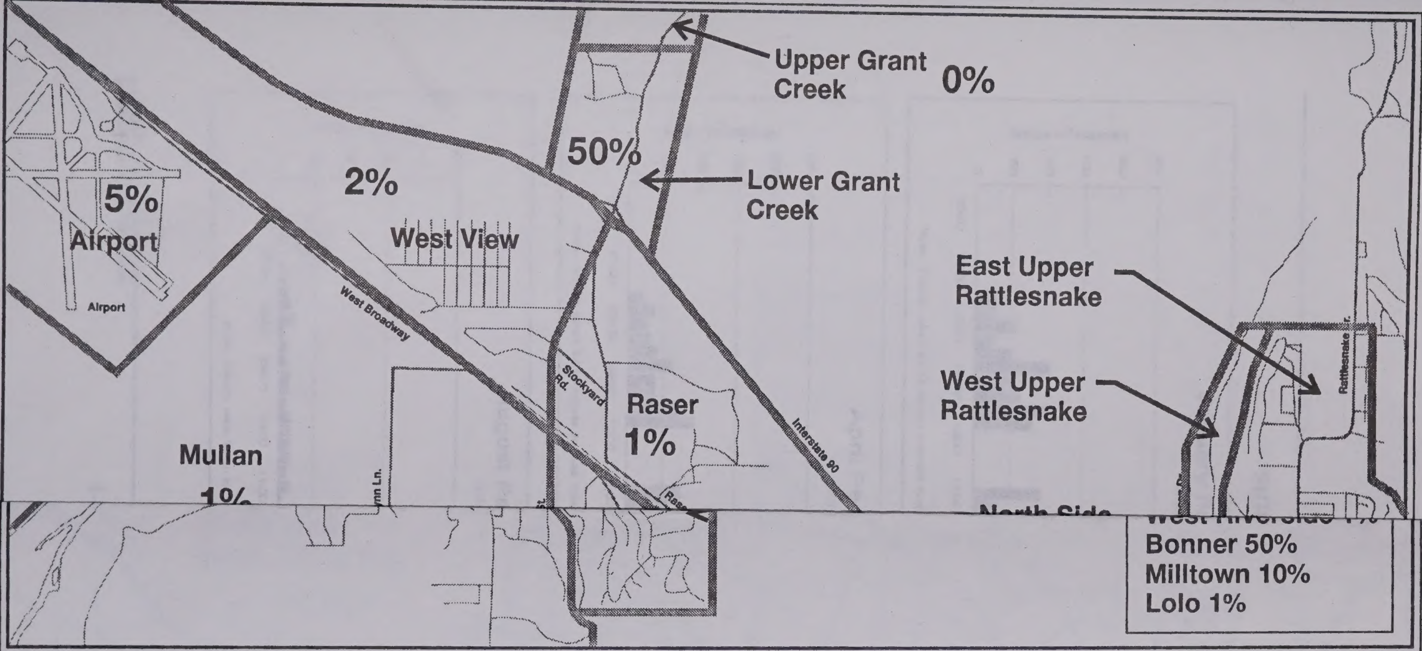
Pedestrian counts were taken at the intersection of University and Arthur Avenues and along the Higgins Avenue Bridge between June 1995 and May 1996. Pedestrian activity was counted at both of these locations each month. A monthly summary of the University/Arthur intersection counts is shown in **FIGURE 4-2**. This location was chosen to provide a sample of pedestrian activity resulting from the University. Pedestrian volumes were highest during the month of January, corresponding to a decrease in bicycle traffic. It appears that there are a significant number of students and/or staff members who either walk or ride their bikes to and from the University, depending on weather conditions.

FIGURE 4-2



Note: Data represents eight hour counting periods. Data was not collected in November.

FIGURE 4-3 illustrates the hourly distribution of pedestrians counted at the intersection of University and Arthur. The high pedestrian activity occurring between 11:00 am and 1:00 pm can be attributed to automobile commuters leaving their cars parked and walking during their lunch hour. A slight increase in pedestrian volumes was also observed in the afternoon, due to shoppers and afternoon "walkers."



Neighborhood Sidewalks

(Blockfaces with Sidewalks by percent)

LEGEND

▬ Area Boundary

69% Percent of Blockface with Sidewalk (per area)

Map - Not To Scale

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URBAN AREA TRANSPORTATION
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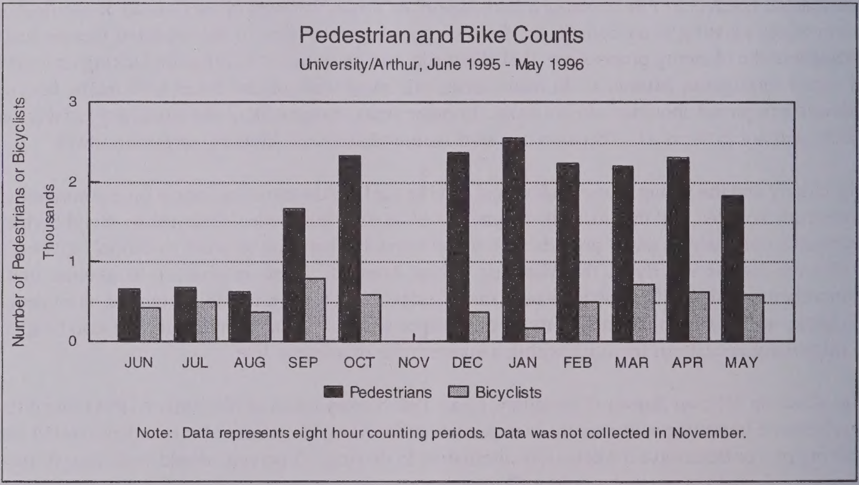
Figure 4-1
Blockfaces That Currently Have Sidewalks

people use paths such as the Kim Williams Trail along the Clark Fork River for exercise and pleasure walking. It is estimated that in the City of Missoula, eight percent of workers and 25 percent of students commute on foot.

Pedestrian counts were taken at the intersection of University and Arthur Avenues and along the Higgins Avenue Bridge between June 1995 and May 1996. Pedestrian activity was counted at both of these locations each month. A monthly summary of the University/Arthur intersection counts is shown in **FIGURE 4-2**. This location was chosen to provide a sample of pedestrian activity resulting from the University. Pedestrian volumes were highest during the month of January, corresponding to a decrease in bicycle traffic. It appears that there are a significant number of students and/or staff members who either walk or ride their bikes to and from the University, depending on weather conditions.

FIGURE 4-2



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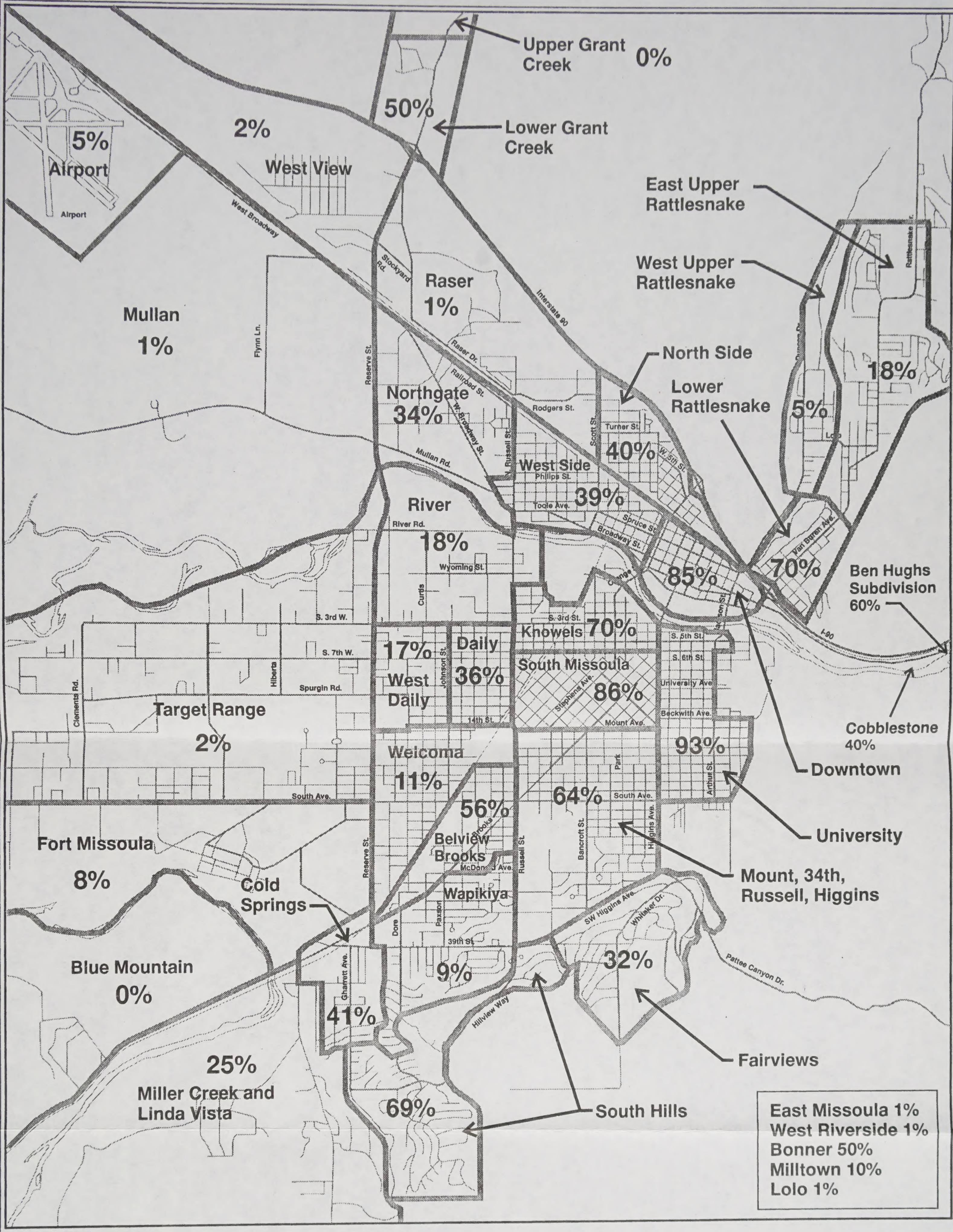

Figure 4-1
Blockfaces That Currently Have Sidewalks

Neighborhood Sidewalks
(Blockfaces with Sidewalks by percent)

LEGEND

▬ Area Boundary

69% Percent of Blockface with Sidewalk (per area)

Map - Not To Scale

N

MISSOULA

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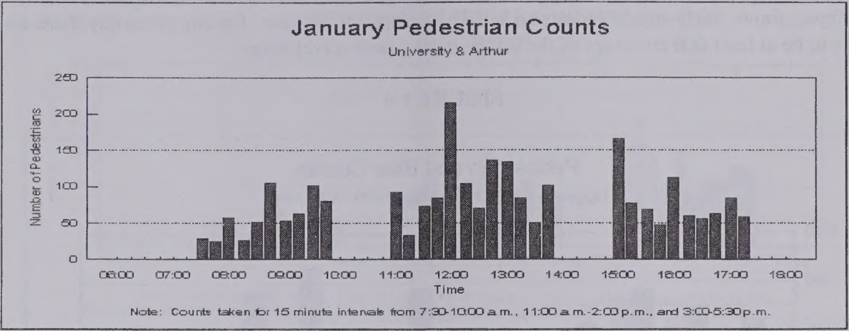
URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996

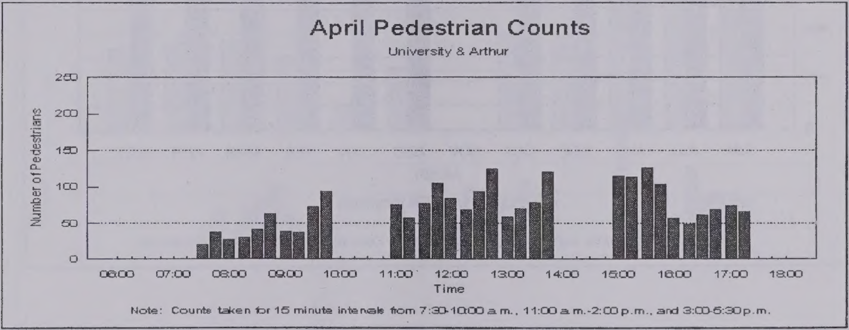
FIGURE 4-3



January Pedestrian Counts

University & Arthur

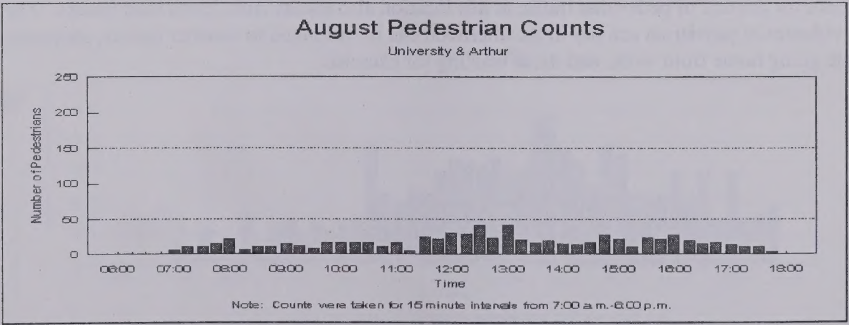
Note: Counts taken for 15 minute intervals from 7:30-10:00 a.m., 11:00 a.m.-2:00 p.m., and 3:00-5:30 p.m.



April Pedestrian Counts

University & Arthur

Note: Counts taken for 15 minute intervals from 7:30-10:00 a.m., 11:00 a.m.-2:00 p.m., and 3:00-5:30 p.m.



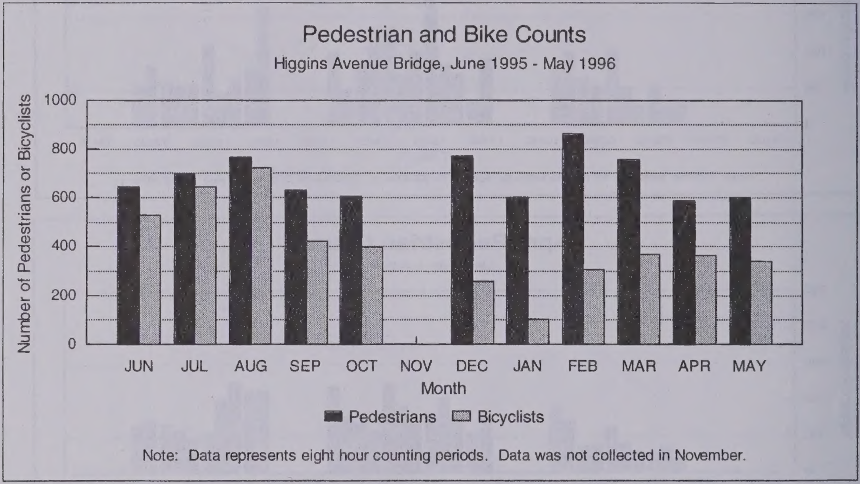
August Pedestrian Counts

University & Arthur

Note: Counts were taken for 15 minute intervals from 7:00 a.m.-6:00 p.m.

Monthly pedestrian count data for the Higgins Avenue Bridge is presented in **FIGURE 4-4**. This count location represents activity by pedestrians traveling to and from the Central Business District. The figure shows fairly steady pedestrian activity throughout the year. On any given day there are likely to be at least 600 crossings of the bridge during peak travel hours.

FIGURE 4-4



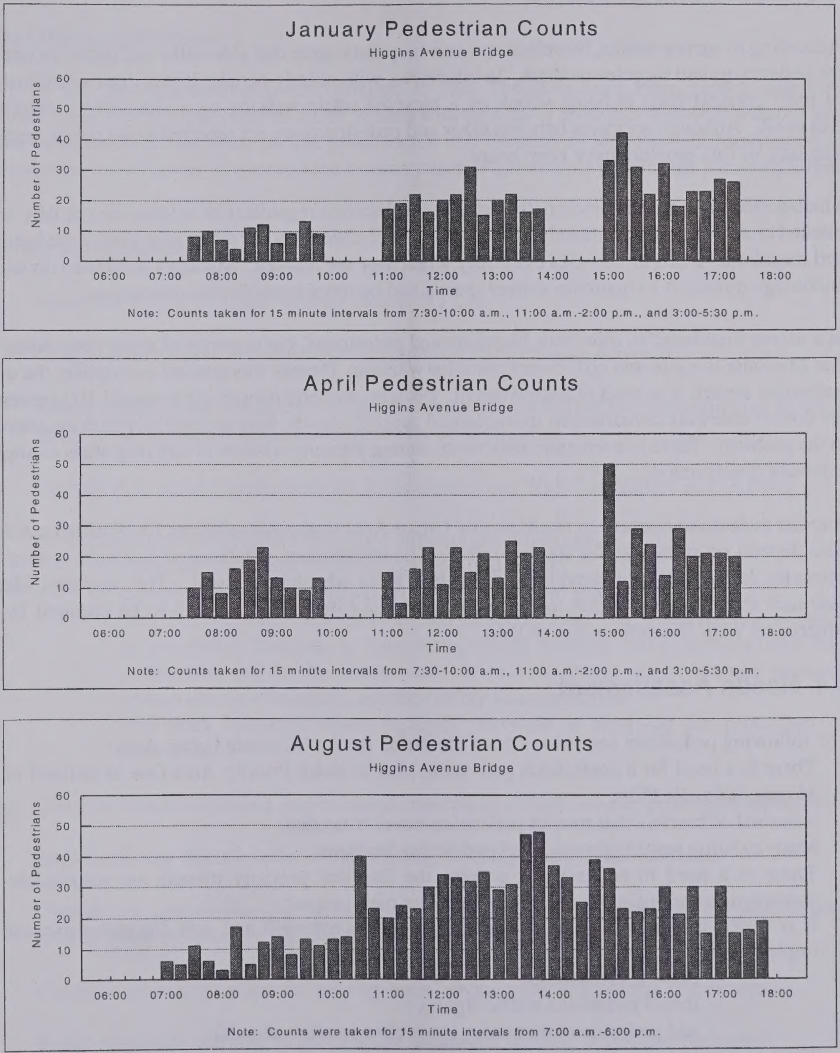
Pedestrian and Bike Counts

Higgins Avenue Bridge, June 1995 - May 1996

Note: Data represents eight hour counting periods. Data was not collected in November.

FIGURE 4-5 shows hourly pedestrian counts at the Higgins Avenue Bridge. The data indicates that a significant amount of pedestrian traffic at this location also results from lunch hour breaks. The high volumes of pedestrian activity in the afternoon can be attributed to weather factors, shoppers, people going home from work, and those walking for exercise.

FIGURE 4-5



January Pedestrian Counts

Higgins Avenue Bridge

Note: Counts taken for 15 minute intervals from 7:30-10:00 a.m., 11:00 a.m.-2:00 p.m., and 3:00-5:30 p.m.

April Pedestrian Counts

Higgins Avenue Bridge

Note: Counts taken for 15 minute intervals from 7:30-10:00 a.m., 11:00 a.m.-2:00 p.m., and 3:00-5:30 p.m.

August Pedestrian Counts

Higgins Avenue Bridge

Note: Counts were taken for 15 minute intervals from 7:00 a.m.-6:00 p.m.

4.3 Issues and Concerns

According to survey results, bicyclists and non-bicyclists agree that sidewalks and paths are not safe for pedestrians and bicycles to share. In interviews with elderly people, it was discovered that one of their greatest fears is being struck by a bicyclist while walking on a sidewalk or entering a crosswalk. Although accidents between bikes and pedestrians are not reported to the police, personal accounts of this problem have been heard.

Montana state law requires motorists to stop for pedestrians regardless of whether or not they are in marked crosswalks. Unfortunately, the law is not well understood by either motorists or pedestrians, and most believe that crosswalks exist only when they are marked. Marked crosswalks do tend to encourage motorists to maintain slower speeds and be more watchful for pedestrians.

In a survey distributed to motorists, bicyclists and pedestrians, the majority of those responding felt that Missoula is a safe and convenient place for walking. Despite this general perception, the city's pedestrian system is in need of improvement. Because property owners are assessed 100 percent of the cost of sidewalk construction in residential neighborhoods, they are unlikely to draw attention to the problem. There is even more reluctance among property owners in outlying areas to support sidewalk construction.

Another pedestrian concern in the Missoula Urban Area is accommodations for disabled residents who depend on sidewalks for transportation. The intermittent, deteriorated sidewalk system that currently exists does not provide a safe network for wheelchair travel. The proposed *Master Sidewalk Plan* points out that improvements to area sidewalks are likely to be required by the Americans With Disabilities Act (ADA).

4.4 Needs Assessment

The following pedestrian needs have been identified for the Missoula Urban Area:

- There is a need for a continuous pedestrian system along Priority Area One as defined in the *Master Sidewalk Plan*;
- Removal of barriers that restrict pedestrian travel is needed;
- Many existing neighborhoods need pedestrian facilities;
- There is a need to educate and enforce the fact that property owners are responsible for construction and maintenance of sidewalks on their property
- It is necessary to ensure that major arterials are convenient and safe for pedestrian use by implementing the following measures where appropriate:
    - provide crosswalks
    - install pedestrian traffic signals
    - add pedestrian sanctuaries (protective median islands);
- There is a need to improve the current corridor lighting system.

4.5 Recommendations

Project Recommendations

Many of the recommended projects included in this Transportation Plan include sidewalk improvements. These improvements are consistent with the *City of Missoula Master Sidewalk Plan.* Please reference this document for the exact nature and location of the sidewalk improvements mentioned below. Chapter 12 contains the recommended improvement plan for the Missoula Urban Area.

Program Recommendations

1. Adopt the *City of Missoula Master Sidewalk Plan.*
2. Complete the *City of Missoula Master Sidewalk Plan* Priority Area One;
3. Adopt a policy that considers that all residential streets within the city limits (or in areas likely to be annexed) should have sidewalks on both sides;
4. Comply with requirements included in the Americans With Disabilities Act (ADA);
5. Provide marked crosswalks where the following conditions exist:
    - signalized locations (intersections and mid-block)
    - school zones and recommended walking routes to schools
    - intersections where the legally-defined unmarked crosswalk is deemed less safe than an alternative location, to minimize crossing distance and reduce the time that pedestrians are in the street, and to provide better sight distance between pedestrians and motorists, or other safety considerations
    - mid-block locations where a legal crosswalk is desirable for protection of pedestrians
6. Consider special surfacing and/or raised crosswalks at high volume pedestrian locations;
7. Explore the use of curb bulbs at intersections with high pedestrian volumes;
8. Consider the impacts that free right turns and other roadway capacity-enhancing projects may have on pedestrian safety and convenience during the planning process;
9. Consider providing exclusive "all-way walk" signal phases in several key locations;
10. Install crosswalk warning beacons where additional warning is deemed necessary;

11. Consider roadway designs and appropriate traffic calming in combination with other improvements to manage speeds along sections of arterials that are commercial/pedestrian oriented;

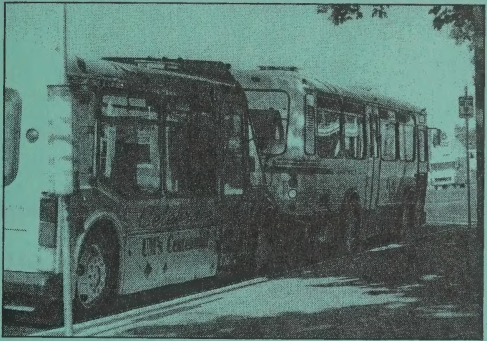
12. Develop and implement a "Recommended Routes to School Program" with cooperation of all school districts;

13. Develop a linked system of multi-use trails and foot paths on abandoned railroad grades, and along streams, rivers or other natural corridors that provide a pleasant walking experience;

14. Increase public awareness about the rights and responsibilities of pedestrians through a media campaign followed by a strong enforcement program;

15. Install signs on multi-use paths indicating mixed use and advising pedestrians to keep right.

Chapter 5: Transit System Analysis



5.0 Transit System Analysis

This chapter discusses transit services that are available to the public in the Missoula area. These transit services take the form of: the Mountain Line bus system, public school buses, regional bus lines, taxi service, and paratransit providers.

5.1 Mountain Line

The Missoula Urban Transportation District (MUTD) was established by voters in the Missoula area in June, 1976. In December, 1977 the Mountain Line system began operation, providing public transportation to the Missoula area.

5.1.1 MUTD Visions

The MUTD has the following visions for the Mountain Line system:

Community
- A transit system capable of serving an expanding community with convenient, efficient, safe and affordable mass transit.
- A flexible and innovative system. Mass transit should be the first choice option. Community involvement should include energy saving, clean environment, partnerships, cultural visibility and community ownership.

Workplace
- A system that provides a safe, pleasant, productive, efficient and satisfying working environment for employees of Mountain Line.
- Working relationships that are characterized by common respect, shared responsibilities and involvement, open, honest communications and acceptance of the benefit of each other and Mountain Line.

Service
- A system that provides safe, convenient, accessible service with coverage to all commercial and residential centers in our community.

5.1.2 MUTD Goals

The MUTD has the following goals for the Mountain Line system:

Operational
- Increasing safety through accident reduction
- Increasing convenience by expanding boundaries and increasing service frequency
- Expanding ridership and improving passenger amenities and infrastructure
- Lowering or eliminating fares

- Improving customer service
- Developing a community-integrated Transit Center
- Encouraging increased infill development
- Increasing intergovermental involvement in budgeting issues
- Increasing transit education
- Improving transit visibility
- Developing new private and public partnerships with:
    - Medical community
    - MRA, Parking Commission
    - CVB/Tourism
    - Sporting venues
    - Malls (Southgate, Northgate)
    - City, County, State
    - Private business, industry
    - Missoula Aging Services
    - Hotels and motels
    - Bars, taverns, casinos
    - Theaters
    - MRL rail service
    - Marketing
    - Neighborhoods

Funding

- Developing adequate local funding for transit infrastructure and operating expenses
- Maximizing the use of all Federal transit assistance programs

5.1.3 Fleet and Service Area

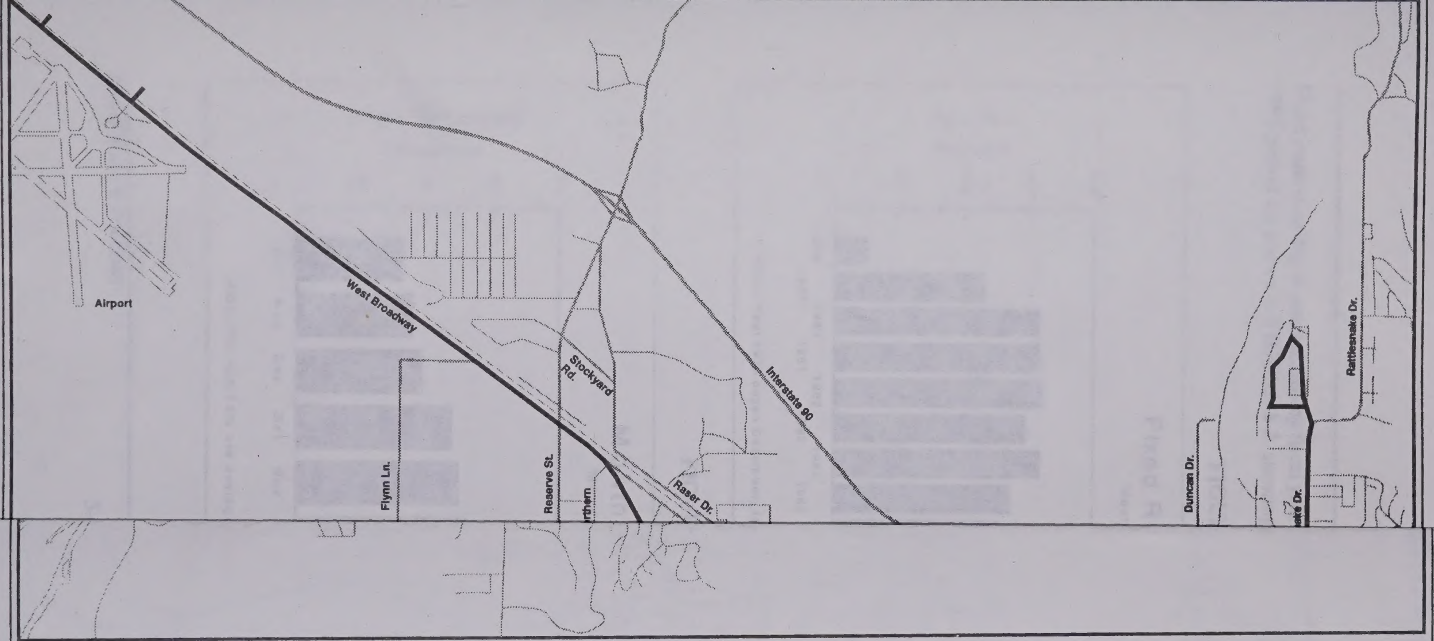
The Mountain Line system operates within a 36 square mile area, providing service to the communities of Missoula, East Missoula, Bonner, Target Range, Rattlesnake, and to the Stone Container Company. Expansion of the district boundary is being considered to include Lolo, South of 55th Street, Miller Creek, and Lower Grant Creek.

Mountain Line operates a total fleet of 27 vehicles. Fourteen fixed-route buses, two paratransit vehicles, and one Senior Van operate during weekday peak hours. Seven buses accommodate riders during weekday midday periods, and eight buses are in operation for Saturday service.

Mountain Line service is provided on eleven fixed routes from approximately 6:00 am to 7:00 pm Monday through Friday, and 9:45 am to 6:30 pm Saturdays. No fixed-route transit service is provided on Sundays or the following holidays: New Year's Day, President's Day, Memorial Day, Fourth of July, Labor Day, Columbus Day, Thanksgiving and Christmas. Route trip times vary from one-half hour to one hour, depending on the route. Each fixed route begins and ends at the Missoula County Courthouse (downtown on Broadway between Woody and Ryman). A map of all Mountain Line fixed routes is shown in **FIGURE 5-1**.

5.1.4 Ridership

In April, 1994 Mountain Line installed denominators to allow counting of riders by route each day. Prior to this time, only total passengers per day were counted on the system. Counts between May and August of 1994 indicated that an average of 163 riders were on each weekday route. These counts also found an average of 18 weekday riders per hour on each route.



Transit Service Area

LEGEND

▬ Bus Route

Map - Not To Scale

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Figure 5-1
Transit Service Area

- Improving customer service
- Developing a community-integrated Transit Center
- Encouraging increased infill development
- Increasing intergovermental involvement in budgeting issues
- Increasing transit education
- Improving transit visibility
- Developing new private and public partnerships with:
  - Medical community
  - MRA, Parking Commission
  - CVB/Tourism
  - Sporting venues
  - Malls (Southgate, Northgate)
  - City, County, State
  - Private business, industry
  - Missoula Aging Services
  - Hotels and motels
  - Bars, taverns, casinos
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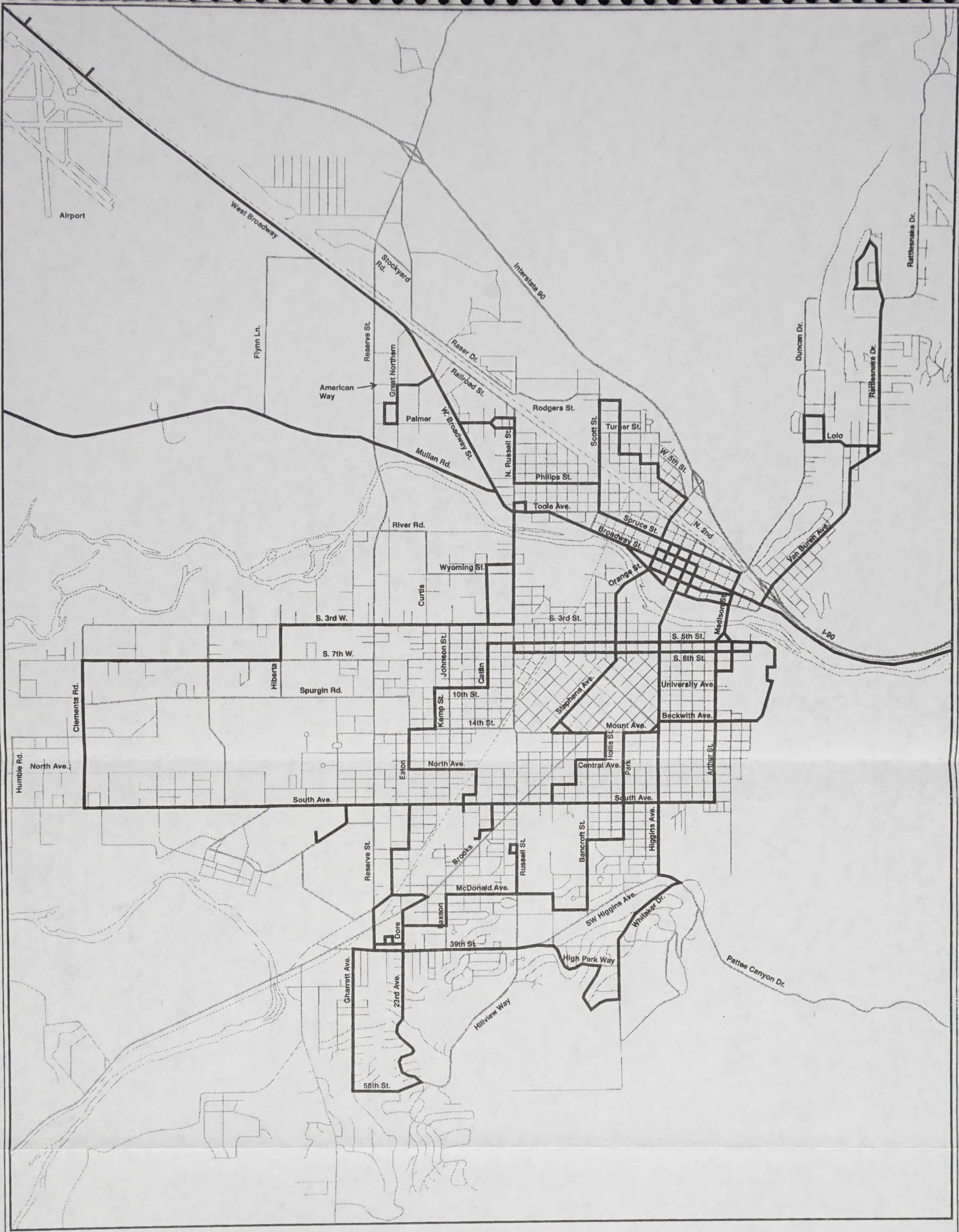

Figure 5-1
Transit Service Area

Transit Service Area

LEGEND

Bus Route

Map - Not To Scale

N

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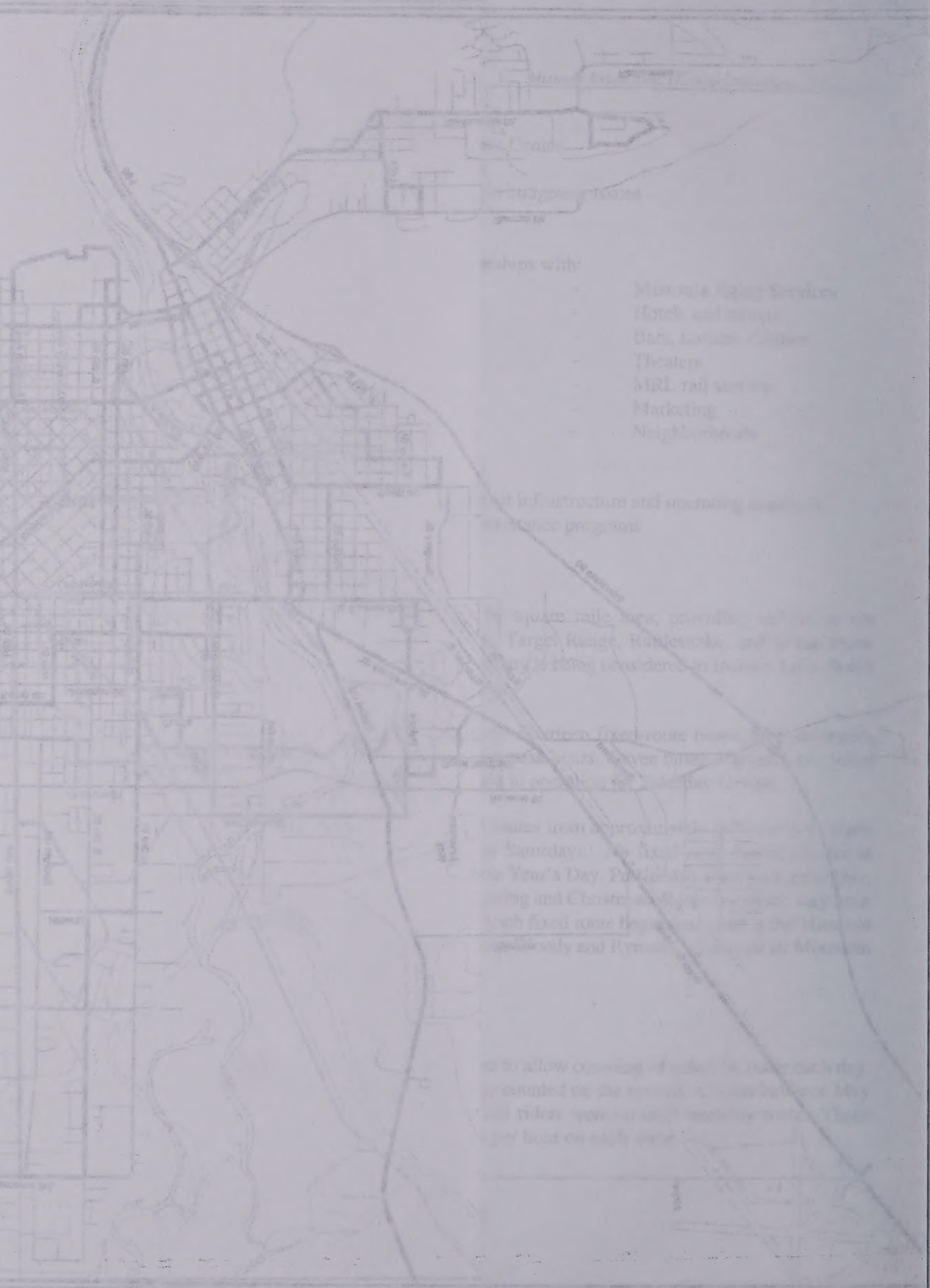
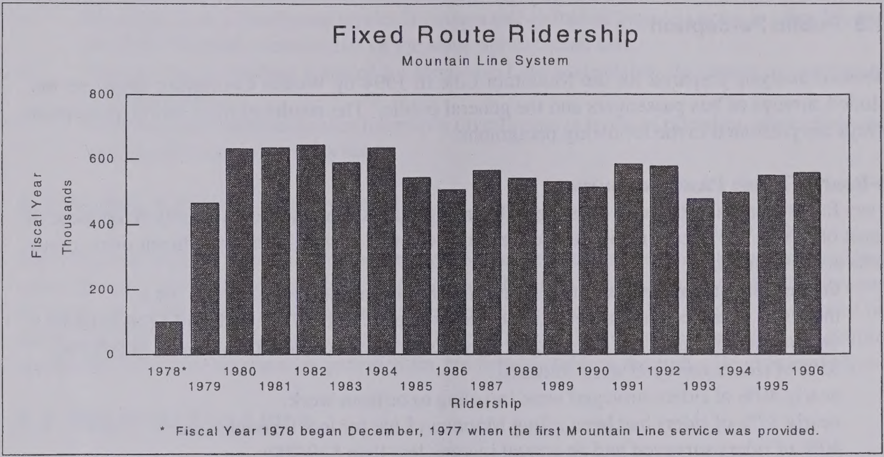
PLAN UPDATE - 1996



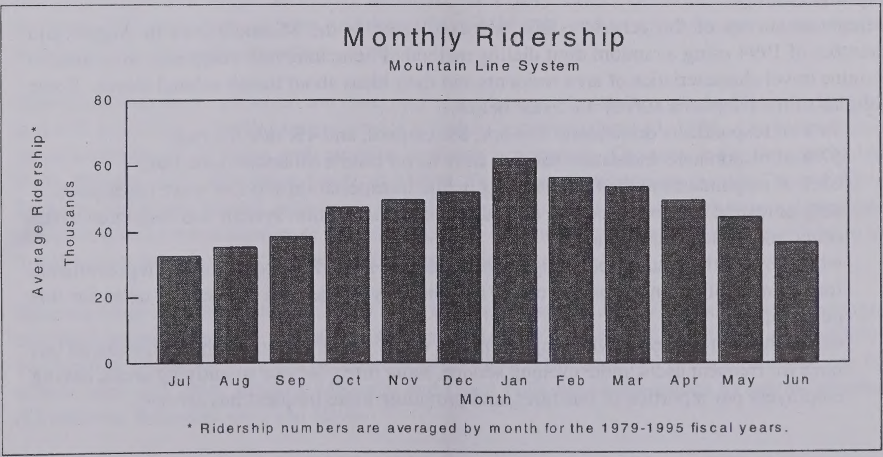
Fixed route ridership is summarized by fiscal year in **FIGURE 5-2**. Monthly averages for the 1979-1995 period are shown in **FIGURE 5-3**, showing seasonal variation in numbers of passengers.

FIGURE 5-2



* Fiscal Year 1978 began December, 1977 when the first Mountain Line service was provided.

FIGURE 5-3



* Ridership numbers are averaged by month for the 1979-1995 fiscal years.

Mountain Line's fare structure features discounts for seniors and disabled persons, while children and University of Montana students and faculty ride free. The University pays an annual flat fee to MUTD to provide this service under contract. The system also offers a variety of multi-ride passes at discounted rates.

5.1.5 Public Perception

A service analysis prepared for the Mountain Line in 1994 by Weslin Consulting Services, Inc. included surveys of bus passengers and the general public. The results of these public perception surveys are presented in the following paragraphs.

On-Board Transit Passenger Survey
Survey forms were distributed to passengers boarding each Mountain Line weekday fixed route in August of 1994. The overall response rate for the survey was 38.4%. Some significant rider survey results are as follows:

- the largest percentage of riders fell into the 18-24 year old age group (21.3%);
  there was nearly equal representation of riders aged 25-34, 35-44, and 45-54 (16.8-19.4%);
  the lowest percentages of riders were aged under 18, 55-64, and 65 and over (8.0-8.1%);
- 35% of riders surveyed were students;
- nearly 40% of riders surveyed were traveling to or from work;
- nearly 37% of riders had been riding Mountain Line for less than one year;
- 40% of riders surveyed had an annual income less than $10,000;
- more than 40% of riders surveyed had no automobile in their household.

Telephone Survey
A telephone survey of the general public was conducted in the Missoula area in August and September of 1994 using a random digit dialing method. Phone interview responses were used to determine travel characteristics of area residents and their ideas about transit-related issues. Some highlights of the telephone survey are listed below:

- 74% of respondents drive alone to work, 8% carpool, and 4% ride the bus;
- 57% of respondents indicated that they have never used a Mountain Line bus;
- 63% of respondents agreed that existing public transportation services were inadequate;
- 80% of respondents believed that a good public transportation system was important to the economic health of the area;
- while 63% of those surveyed thought that tax dollars should be used to make improvements for future public transportation, only 41% said they would vote to increase taxes for this purpose;
- the six highest-ranked service improvements were: more passenger shelters, reduced bus fares for frequent users, more evening service, more direct service to outlying areas, having employers pay a portion of bus fares, and providing more frequent bus service.

5.1.6 Transit Service Evaluation

The 1994 service analysis included a comparison of MUTD's fixed route operations with peer groups with similar service areas and populations in the West and Midwest. The conclusions of this peer group transit system comparison are presented below:

- Mountain Line's fixed route service is comparable to that of transit systems in other Western and Mid-Western communities of the same approximate size.
- The amount of funding invested by Mountain Line is similar to that spent by comparable transit services.
- Mountain Line receives similar returns on investments in terms of ridership, productivity and annual passenger trips as its peers.

5.2 Public School Transportation

The Missoula County Public School District (MCPSD) offers students bus transportation to and from school through a contract with a private carrier, Beach Transportation Company. MCPSD operates 85 buses each school day, providing regular service to 23 schools in the District. The school bus service transports 5,600 children in grades K-12 on 70 individual routes twice daily. In addition, special transportation services are provided for pre-school children through a Head Start program.

5.3 Regional Bus Lines

Missoula is currently served by two regional bus lines which operate out of a single terminal located at 1660 West Broadway. Greyhound Bus Lines and Rimrock Stage (Rimrock Trailways) provide both passenger and freight service to Missoula on a daily basis. Between the two carriers, an estimated 120 passengers originate and depart from Missoula, and an approximately equal number terminate their trip at the Broadway terminal.

Greyhound runs three eastbound and three westbound buses each day through the Missoula terminal, and will be adding a fourth express service schedule beginning June 19, 1996. Greyhound buses travel I-90 through Montana and interstate corridors nationwide. Connections to the east include Butte, Billings, and points beyond as far as Maine. To the west, connections include Coeur d'Alene, Spokane, and points beyond, with routes extending to Seattle and California. A terminal employee remarked that a notable number of passengers use the Greyhound bus service for connections to the Spokane airport where they can get lower rates on airline service.

Rimrock Stage runs two buses each way daily between Missoula and Whitefish, where passengers can make connections with Amtrack passenger rail service across northern Montana. In addition, one bus travels each way daily between Missoula, Helena, Townsend and Billings. Finally, one bus travels each way daily between Missoula and Great Falls with connections to central Montana (Lewistown, Roundup, etc.) and Havre.

Two of the service providers listed in the 1985 transportation plan update are no longer in operation in Missoula. Intermountain Bus Line went out of business in July of 1994. All of their routes were picked up by Rimrock Stage, with the exception of their service to Phillipsburg and Anaconda. Bitterroot Stage, formerly operating out of Hamilton, has a disconnected phone number with no forwarding information.

In addition to public bus lines, there are two private bus charter/rental companies listed which serve the Missoula area: Beach Transportation Company, and L&B Busing, Inc. (Florence).

5.4 Taxi Service

Yellow Cab, Inc., privately owned and operated by Bob Gray, provides taxi service in Missoula and the surrounding area. The company has a fleet of five taxi cabs (four standard sedans and one station wagon) and ten drivers, but run a maximum of four cabs at a time. The company provides call-in service 24 hours a day, seven days a week, with coverage extending for a 50-mile radius around Missoula.

5.5 Paratransit Services

Special transit services (STS) were implemented by Mountain Line at the beginning of fiscal year 1991. These operations consist of a paratransit service for ADA eligible passengers, and a Senior Van service for passengers over sixty. The special transit fleet consists of three paratransit buses and one van. During its first five years of operation, (fiscal years 1991-1995), the STS carried an average of 1,286 to 1,570 passengers each month. Trips on these two services must be scheduled in advance.

Additionally, the Missoula Community Medical Center operates a bus capable of carrying three people in wheelchairs and four ambulatory riders. This bus operates between the hours of 8:00 am and 4:30 pm within an eight-mile radius of the Medical Center. The service is provided at no charge to patients participating in rehabilitation programs, as well as to patients with disabilities who have been referred for treatment. The service is door-to-door, picking each patient up at their home, bringing them to the Medical Center, and returning them home when their treatment is completed.

St. Patrick's Hospital indicated that they used to have a van for providing special transportation services to their facility, but they no longer operate this service. Missoula Aging Services contracts with Mountain Line for operation of a Senior Van service.

5.6 Transit Issues and Concerns

Through interviews with people who ride the Mountain Line buses, individuals involved in operating the Mountain Line system, and the general public, the following issues and concerns were raised about Missoula's transit system:

- The Mountain Line system is a valuable component of the City's transportation system, and its long-term operation needs to be assured.
- The transit system needs to be as user-friendly as possible, in terms of routes, schedules, and bus stop amenities.

- Obtaining available federal funding is a concern, since local matching funds are limited by maximum allowable levels on property value mill levies.
- Low levels of ridership are a concern. It is desirable to encourage more people to utilize the public transit system.
- The lack of availability of service in the evening hours, on Sundays, and on holidays is a concern.
- Existing routes should be revised, and new routes should be added in response to growth, including new residential and commercial development, in the Missoula urban area.
- The transit system should be accessible to users of other modes of transportation, such as pedestrians, bicyclists and drivers of personal vehicles.
- There is a great deal of interest in developing a new off-street bus transfer facility to replace the current on-street central loading and unloading area at the Courthouse. On-street transfers create safety and traffic congestion concerns.
- There is an ongoing need for education to increase public awareness of available transit services.

5.7 Needs Assessment

This section discusses methods of addressing concerns and deficiencies in the transit services currently available in the Missoula urban area. It is important to note that, although the majority of people in the Missoula area support the transit system, a very small percentage of these people actually use transit services. The TDM analysis indicates that massive capital improvements alone would not significantly increase ridership of the transit system. Nonetheless, it is apparent that the community does want public transit to play a supporting role in the Missoula transportation system.

The existing Mountain Line transit system needs to be improved through creative use of ridership programs that encourage greater participation by select groups. There are also some needs in the current Mountain Line system for improved and expanded transit facilities.

In addition to the existing Mountain Line system, other transit alternatives can and should be promoted and pursued in an effort to reduce travel demand in the Missoula urban area. There are a variety of effective methods currently in use on a small-scale basis, which could be expanded to include a larger portion of the population. In addition, new and innovative ideas which have been implemented in larger urban areas around the country could be tailored for application in Missoula.

5.8 Transit System Recommendations

The transit recommendations included in this Plan are consistent with the *Missoula Urban Transportation District Transit Development Plan* and the *Mountain Line Service Analysis*. Please reference these documents to identify the recommendations outlined in these existing plans.

The ideas presented in this section are intended to improve the effectiveness and adequacy of Missoula's transit services in order to accommodate growth and change in travel needs over the 20-

year planning horizon. The goal of transit system recommendations is to reduce traffic volumes on roadways in the Missoula urban area. The overall recommendation for the Mountain Line is to sustain and nurture the public transit system currently operating in Missoula with the available funding. It is also recommended that the community support changes to the laws of the State of Montana that would allow more funds to be allocated for transit operation.

5.8.1 Mountain Line Service Area Expansion

The need for expansion of existing routes or addition of new routes should be evaluated periodically. Possible new routes are identified below:

- A Reserve Street route could be added to the system to serve the many existing and future shopping centers located in the developing area along that arterial.
- A new route should be considered to serve the Lolo and Stevensville areas to accommodate the commuting and shopping needs of these significant populations with no alternative but to drive U.S. 93 into Missoula under the current system.
- A future Linda Vista route could be added to serve the lower Miller Creek area in the event that major residential development takes place.
- A route could be considered to provide service to the proposed Mullan Road/Airport arterial grid as that area is developed.
- Both Russell Street and Brooks should be considered for corridor service, as they are two major arterial routes in the Missoula urban area not currently served by the transit system.
- Consideration should be given to providing a number of commuter express routes during peak commuting hours (morning and evening) between areas of high residential concentration and areas of high business concentration.

Please note that although route expansion concepts should be re-evaluated on a regular basis, massive expansions to the system should be avoided unless significant gains in ridership can be foreseen.

5.8.2 Alternative Rate Structures

Consider alternative rate structures, including the possibility of free ridership, in order to increase transit use. It is important that transit be affordable to the general public, especially the elderly and the youth of the community.

5.8.3 Mountain Line System Recommendations

Expanded ridership programs for the Mountain Line system could take a variety of forms. The existing contract with the University of Montana (UM) has been very successful since its inception in September of 1990. This program should be promoted and expanded where possible, and can be used as a model for similar agreements between the Mountain Line and various employers in the Missoula area.

Other opportunities exist for expanded ridership through special promotions. Temporary routes and discounts could be used to promote use of the transit system for special events in the community. A summer youth pass could be made available to provide convenient, affordable service to kids during their "free" season. Free ride days could be advertised occasionally as a marketing tool to encourage non-users to try the Mountain Line. A program that is being tested in Milwaukee offers free rides on city buses on days when ozone levels are high, in an effort to reduce ozone pollution from cars. These "Clean Commute" days are supported by the state Department of Natural Resources through a federal grant. Minnesota's Twin Cities have established an incentive program for regular bus riders, which includes discounts for frequent use as well as special offers for program participants who induce non-riders to use the system.

One key to a successful transit system is education - informing existing and potential riders of the system's benefits. Since public transit can be especially important as a transportation alternative for the youth and elderly of the community, special effort should be made to educate these groups about the system.

Recommended transit facility improvements for the Mountain Line focus on making the system attractive to the potential rider by improving convenience and amenities. Passenger shelters should be provided at any bus stop with 15 or more daily boardings. These shelters should be lighted, protected from wind and rain, and should provide seats, a trash container and an information board including a current route map. In addition, sidewalks should be provided that connect transit stops to the local sidewalk network. Pullouts should be considered for bus stops with more than ten boardings per day located on streets with operating speeds of more than 35 miles per hour. Existing transit vehicles should be made bike compatible through provision of externally-mounted bike racks. Consideration should be given to providing "park and ride" facilities for commuters and shoppers driving in from outside the Missoula urban area.

Transit-friendly growth should be promoted within the community through requirements placed on new development. Transit oriented requirements could include provision of a bus shelter at an appropriate location within any new development with a specified level of trip generation. Community infill benefits the transit system because it increases the tax base of an area, and provides opportunities for increased ridership without expanding the service area. For this reason, a "waiver of protest" of the Transportation District (MUTD) should be required for all new development.

This Plan includes a recommendation to make $2 million available through the CMAQ Program for various transit improvements. The specific details about the types of transit improvements will be determined at a later date. This project was included in response to public comments received through the public hearing process, which indicated a desire for increased transit service.

5.8.4 Alternative Transit Recommendations

Telecommuting allows an employee to work at home or another remote location by providing any necessary communication with their employer through telephone, fax and modem connections. This concept can significantly reduce commuter demand on the transportation system, taking cars off the road during peak travel times. Missoula was selected by the Montana Department of Natural Resources and Conservation (DNRC) in conjunction with the Montana Department of Health and Environmental Sciences (MDHES) as the site of a demonstration project in telecommuting. The two-year program has a goal of reducing carbon monoxide emissions and suspended particulate pollution by reducing the number of vehicle miles driven. The DNRC-administered project is targeted at employed individuals who have commutes of more than 20 miles one-way.

Peak levels of traffic volumes could be substantially reduced by altering the work schedules of government employees working in the Missoula urban area. By moving the work shift times of this one category of workers away from the current peak travel hour, peak volumes could be decreased by as much as 25%.

Ride sharing in the form of car- and van-pools should continue to be aggressively promoted by major employers in the Missoula urban area. Any method of increasing the occupancy of commuter vehicles will have positive effects on traffic congestion and air quality in the community.

5.8.5 Intermodal System Connections

This Plan recommends that all of the transit systems mentioned in this chapter work together to make each system available to users of the other forms of transit. The use of multiple forms of transit and the ability to transfer from one system to another should be made as convenient as practical. Cooperation and coordination between transit system operators, including the regional bus service providers, school bus system managers, taxi companies, and paratransit providers is necessary to achieve a totally integrated community transit system. These groups should meet with the Mountain Line on a regular basis to review and explore possible ways to improve transit system interconnection possibilities.

Chapter 6: Other Commercial Transportation Services

6.0 Other Commercial Transportation Services

6.1 Freight and Transport Services

Trucking is provided by a number of private transport carriers that serve the Missoula area. Commercial truck transport is available in the areas of heavy hauling (approximately 20 companies), light hauling (one company), liquid or dry bulk (approximately 10 companies), local cartage (two companies), motor freight (approximately 15 companies), movers (approximately seven companies), and delivery services (approximately six companies).

From a strategic standpoint, it is desirable for the City and County governments to keep heavy loads on State and Federally financed and maintained roadways. It is also desirable from the standpoint of keeping residential neighborhoods safe and quiet. The County does not have any legal authority to designate truck routes, but is responsible for monitoring and maintaining the condition of roads within its jurisdiction. To this end, the County has established load limits on all of its bridges, and will periodically place temporary hauling limits on specified road sections to protect surfaces in danger of breaking up during seasonal freeze/thaw conditions. The City has an ordinance establishing truck routes within the Missoula city limits. Designated truck routes for the City of Missoula are shown on **FIGURE 6-1**.

It is noteworthy that information regarding truck routes through the city was not easy to obtain, and field observations indicate that truck routes are not adequately signed in Missoula. It is recommended that the City make truck route maps readily available to hauling companies, and use appropriate signing and enforcement to ensure proper use of the designated routes.

Interviews with freight haulers in the community indicate a concern that the city's arterial network continue to be maintained to allow for the convenient movement of goods through the area. This movement of goods is considered to be essential to businesses in the area. Access to I-90 and the railroad are of prime importance to freight transporters; and I-90 and Reserve Street are the most popular truck routes from the standpoint of regional transport of goods.

The topic of a western truck bypass route has been brought up in the past, as regional truck traffic does pass through Missoula. However, modeling does not indicate that a significant amount of this traffic would choose to completely bypass the community if such a route were available. Therefore, a western truck bypass route is not being considered for implementation during the life of this plan.

Most of the heavy industrial activity in the Missoula area is currently located between I-90 and the Clark Fork river, especially near the MRL tracks, allowing convenient truck/train mode shifts in the transport of goods. The area between I-90 and the Montana Rail Link (MRL) tracks from Reserve Street to Scott Street has been identified as desirable for future development and infill with mixed-use commercial and industrial activities. The proposed Russell Street interchange discussed later in this document under Other Major Recommended Improvement Projects has potential to make this area even more desirable for this and other types of land uses. In addition, the community has plans for the development of an industrial park near the proposed new airport interchange, as this site will also provide convenient multi-modal access.

6.2 Air Service

This section discusses commercial and general aviation air service facilities available in the Missoula area. Air service is provided at the Missoula International Airport (Johnson-Bell Field) located adjacent to West Broadway approximately two miles northwest of the Missoula city limits.

Vehicular access to the airport is currently provided exclusively by West Broadway. An airport interchange on I-90 is presented as a committed major network improvement project elsewhere in this Transportation Plan Update. The proposed airport interchange will provide relatively direct access to the airport from I-90.

A one-way loop road allows for traffic circulation between the highway, parking areas, main terminal, and other airport buildings at the site. The loop road widens to four lanes in front of the main terminal, allowing the curb lane to be used for loading and unloading. Parking facilities provided at the airport include 180 short-term and 250 long-term spaces for passenger vehicles, 100 employee spaces, and 160 spaces for rental car company use.

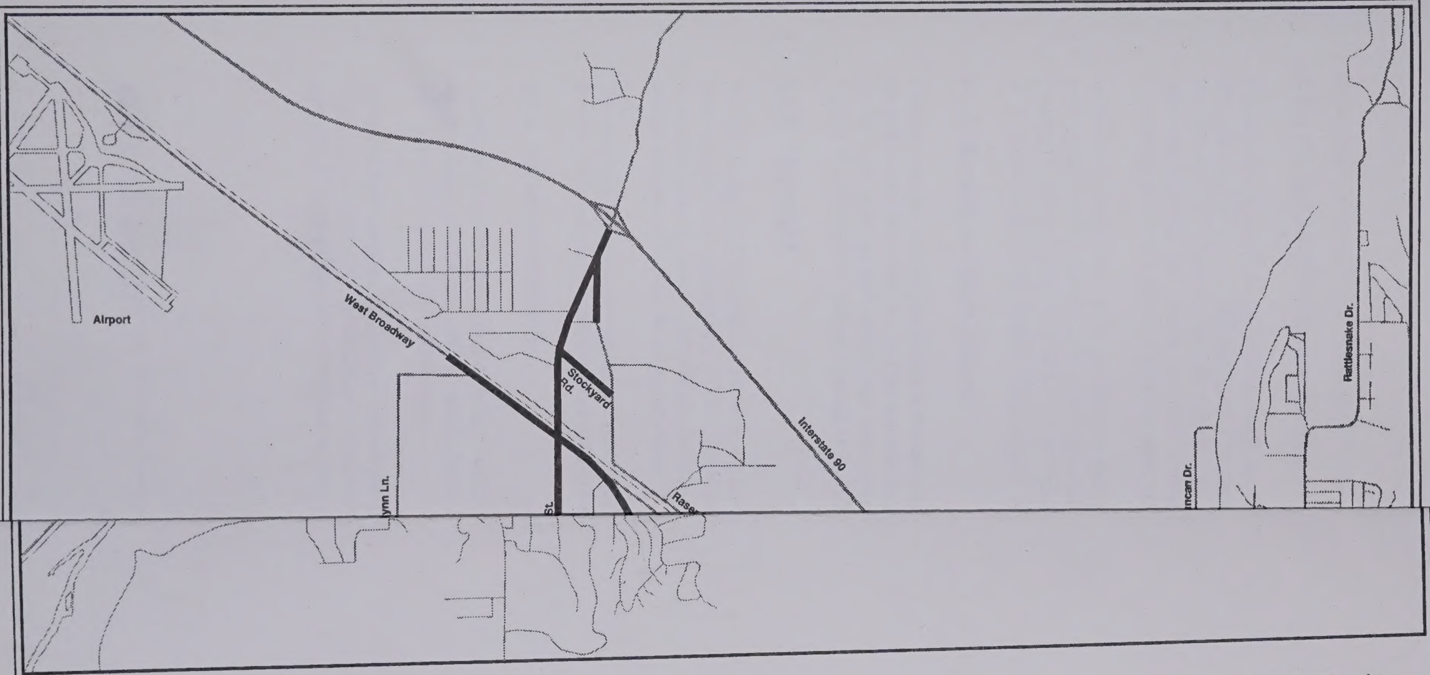
6.2.1 Johnson-Bell Field

Johnson-Bell Field is owned by the Missoula County Airport Authority. The airport has two active runways, 11/29 and 7/25. A major expansion of the passenger terminal building was completed in 1994, providing a total of 100,000 square feet of space. The terminal building currently has gate space for four major airline aircraft parking positions and three commuter airline aircraft parking positions.

Total operations for Johnson-Bell Field were 66,886 in 1995, and are forecasted to be 107,200 in the year 2015. These figures include aircraft operations in the following categories: air carriers, air taxi and commuter, general aviation, and military.

The 1995 Draft Airport Master Plan Update for Johnson-Bell Field indicates the following major land improvements by the year 2015: loop road, parking lot, airport entrance, and terminal expansion. Major air improvements scheduled during the 20-year planning horizon are: ramp expansion - taxiway and general aviation ramp areas, and new taxiways.

The airport is also the location of the U.S. Forest Service Aerial Fire Depot, which provides aerial firefighting and fire training and operations for northern Idaho and western Montana. The Smokejumper Visitor Center is located there as well.



Truck Routes

LEGEND

▬ Designated Truck Route

Map - Not To Scale

N

MISSOULA

URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996

Figure 6-1
Truck Routes

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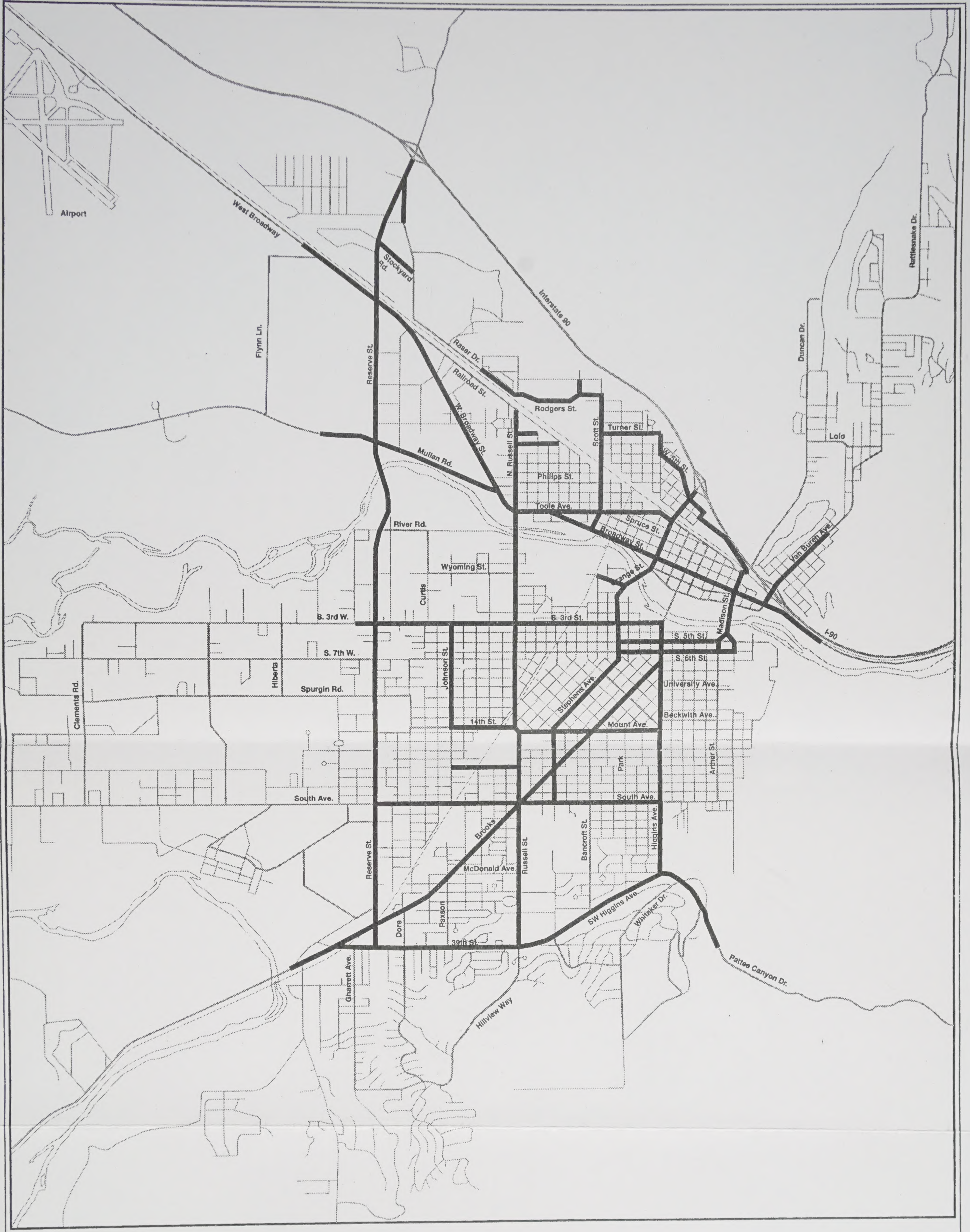


Figure 6-1
Truck Routes

Truck Routes

LEGEND

▬ Designated Truck Route

Map - Not To Scale

N

MISSOULA

URBAN AREA TRANSPORTATION PLAN UPDATE - 1996

6.2.2 Commercial Passenger Service

Commercial passenger service is currently provided at the airport by Delta, Horizon and Northwest Airlines. A total of 175,027 passengers were enplaned, and 174,928 deplaned on commercial airlines in Missoula in 1995. Passenger volumes are forecasted at 388,900 enplanements and 388,900 deplanements in 2015. A total of 11,786 commercial airline departures were recorded in 1994, and 19,400 departures are forecasted for the year 2015.

In addition, charter service is provided by two companies at Johnson-Bell Field. A total of 2,000 passengers were enplaned, and 2,000 deplaned on charter aircraft in Missoula in 1995. Charter passenger volumes are forecasted to be 8,400 enplanements and 8,400 deplanements in 2015. A total of 50 charter airplane departures were recorded in 1995, and 150 departures are forecasted for 2015.

6.2.3 General Aviation Activity

General aviation facilities are based at the east end of runway 7/25. There are approximately 94 based aircraft at Johnson-Bell field. This number includes single- and multi-engine propeller airplanes, business jet aircraft, helicopters, and other privately-owned aircraft. General aviation operations totaled 49,454 in 1994 and are forecast at 78,700 for 2015.

6.2.4 Air Freight

Air freight and package express services are provided by a number of carriers in the Missoula area (approximately 15 companies). This form of transportation is generally used only for lightweight items, and cargo in need of very speedy delivery. Mail, overnight delivery packages, and flowers are among the more common air transport items.

The Missoula International Airport recorded 53,605 tons of deplaned freight, express, and mail cargo in 1995. The volume of cargo is forecasted to be 140,625 tons deplaned in the year 2015.

6.2.5 Intermodal Interface

Airline passengers and air freight carriers currently gain access to the airport using West Broadway. As previously mentioned, surface access to the airport will be greatly improved in the future with the addition of a new I-90 interchange.

Mountain line transit currently serves the airport (6:00 a.m. to 7:00 p.m., Monday through Friday and 9:45 a.m. to 6:30 p.m. on Saturday). Taxi service is available 24 hours a day to shuttle people between the airport and other locations in the community.

6.3 Rail Service

No passenger rail service is available in Missoula. The nearest locations for access of passenger rail service are Whitefish and Shelby. AMTRAK provides passenger service only across northern Montana at this time, having discontinued service to Missoula in 1979.

Montana Rail Link (MRL), headquartered in Missoula, operates 600 miles of mainline track and 300 miles of branch line, providing freight rail service from Huntley, Montana to Sandpoint, Idaho. MRL tracks run generally east-west through the Missoula area between I-90 and the Clark Fork river. An average of 25 MRL trains pass through Missoula each day in both directions. Freight loading, unloading, and track switching activities are handled at the yard office located at 1001 Defoe in northwest Missoula. Freight is also loaded and unloaded at other locations along the MRL Line within the Missoula area where siding tracks have been provided for this purpose.

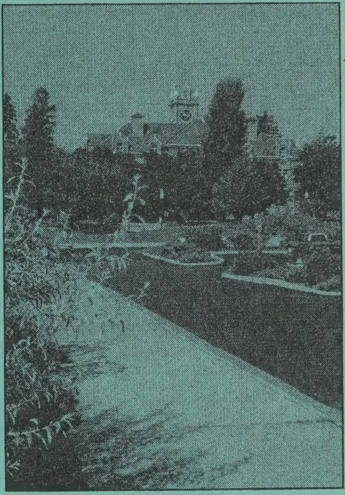
Rail service was examined as a form of transit service for the movement of people between Missoula and portions of the Bitterroot Valley. Light Rail service using the existing Bitterroot Rail Spur line was investigated for possible use to relieve road traffic volumes on U.S. 93 south of Missoula. This type of service was not considered for recommendation because of the cost, lack of expected ridership, and safety concerns.

The analysis assumed a light rail service between Missoula and Stevensville. It was assumed that 5% of all travelers that are forecast to travel this segment of U.S. 93 would use the service, requiring eight light rail vehicles ($8M). The existing single track would require certain upgrades in condition to be suitable for passenger use ($7.5M), and a second track would be required to allow for two-way operation ($45M). Overhead electric cantenary wires ($12M) and at least four terminals ($1M) would also be required. These capital improvements are estimated to cost $73.5M.

If the service was provided for 16 hours per day, it is estimated that the annual operating cost would be approximately $8.4M per year. If a 20-year bond was issued (at 8% interest) to cover the capital and operating cost, it is estimated that a one-way ride would cost approximately $12, assuming that the bond was to be retired using only farebox revenue. Therefore, the cost to commute in to and out of Missoula each day would be $24 per person, not including the cost of bus or cab fare from the light rail station to the work place. At this rate a commuter would spend about $6,500 per year to commute to work on the proposed light rail system.

Based on this analysis it is clear that the cost of the light rail system would be too expensive without a significant public subsidy. It may be affordable at some point in the future, but only if the cost of driving a private vehicle increases significantly. Until that time, a light rail system is not recommended for the Bitterroot Valley.

Chapter 7: Socio - Economic Analysis



7.0 Socio-Economic Analysis

7.1 Population and Economic Baselines and Projections

7.1.1 Uses of Population and Economic Data

The characteristics and needs of the Missoula area transportation system are interrelated with the qualities and spatial distribution of its population and commerce. The size and location of the residential population, and the distribution of business, university, and government activities profoundly influence travel patterns in Missoula.

The QRS-II computer model was used to better understand present and future travel patterns, and to predict and analyze the effects of potential improvements to the transportation system. Road network characteristics, and population, economic and land use data are the key inputs into the transportation model.

The socioeconomic baseline information for the Missoula area was developed from five data sources:

- the 1990 census
- the economic data system of the U.S. Bureau of Economic Analysis (1995)
- the economic data system of the Montana Department of Labor and Industry (1995)
- building permits issued by the City of Missoula and the Montana Department of Commerce (1990-1995)
- septic tank permits issued by the Missoula County Health Department (1990-1995)

Projections of future socioeconomic characteristics were derived from trend-line projections and input from Missoula officials and interested private citizens.

It is acknowledged that the socio-economic conditions in past years have produced the population and employment conditions that occurred during those years. Population and employment projections used in this Plan have been based on these past trends. High, medium, and low growth projections were developed. The medium growth projection was used for the purposes of this Plan.

If socio-economic conditions differ significantly from past years, so will the growth rates. For example, if growth is slower than projected and the recommendations included in this plan are implemented as scheduled, Missoula will be well prepared for the future and the transportation system should function better than anticipated. If the future socio-economic conditions result in a high rate of growth, projected traffic problems will occur earlier than anticipated and the associated transportation improvements will be needed sooner than anticipated. Considering the uncertainty of future socio-economic factors, it was considered prudent to use the medium growth projection which represents the long-term performance of the community over time.

7.1.2 Missoula Area Population Trends

Long-term Population Trends 1940-1996

Missoula County

As shown in **TABLE 7-1**, Missoula County has experienced nearly continuous population growth since World War II. Through much of this period the county has been one of Montana's fastest growing areas. In the summer of 1996, the population for Missoula County is estimated to be about 90,000. Approximately 88,000 of these people live within the Missoula Transportation area, or one of six external areas located adjacent to the planning area ("Greater Missoula").

County-wide growth rates have varied from decade to decade. The Missoula area experienced annual growth rates ranging from 2.2% to 3.3% during the period from 1940 through the 1970s. In the 1980s, the county grew by only 0.3% per year. In the 1990s the county is on pace to grow by about 2.4 percent annually. Since 1970, the county population growth has averaged about 1,200 persons per year.

TABLE 7-1
Historic Missoula County & City of Missoula Population Trends
1940-1996

Year	Missoula County	10-Year % Change	City of Missoula	10-Year % Change
1940	29,038	+33%	18,449	+26%
1950	35,493	+22%	22,485	+22%
1960	44,663	+26%	27,090	+20%
1970	58,263	+30%	29,497	+ 8%
1980	76,016	+30%	42,918	+29%
1990	78,687	+ 3%	42,918	+29%
1996	89,900*	+24%**	50,200*	+28%

* 1996 population is estimated

** the 1990-1996 percent change is prorated for a 10-year period

Sources: U.S. Department of Commerce, Bureau of the Census, Census of Population, 1940-1990. Kate Pope, Office of the Mayor, City of Missoula (1996). Sam Islam, Missoula Office of Planning and Grants (1996).

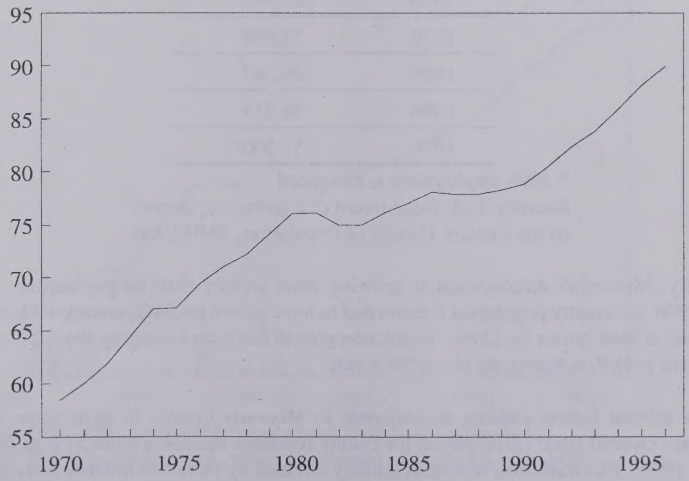
City of Missoula

Population growth within the boundaries of the City of Missoula has been influenced both by overall population growth in the "Greater Missoula Area," and the City's ability to annex urbanizing areas adjacent to its boundaries. From 1950 through the 1970s most new residential development occurred outside of City boundaries. In the 1980s, the City annexed several established residential neighborhoods adjacent to its boundaries, and its population grew much faster than the area's overall population. The population of the City of Missoula continues to grow in the 1990s; again annexation of previously developed areas is a major reason for the City's population growth. Some infilling of undeveloped lands inside the established City limits has also occurred.

Recent Population Trends 1970-1996

FIGURE 7-1 graphically illustrates recent cycles of rapid and slow population growth experienced in Missoula County. The Missoula area experienced rapid population increases in the 1970s and very little growth in the 1980s. In the 1990s, Missoula is again experiencing a period of population growth. The pattern of substantial growth in the 1970s and 1990s, and slow growth in the 1980s is shared by several other western Montana counties.

FIGURE 7-1
Population Trends
Missoula County 1970-1996
(in thousands of people)



7.1.3 Missoula Area Economic Trends

Long-term Economic Trends 1940-1996

Missoula County has experienced growth in employment and personal income each decade since World War II. Historic employment figures for the County are presented in **TABLE 7-2.** The vast majority of Missoula County employment, personal earnings, and commerce occurs in the "Greater Missoula" area.

While most of the recent increase in population has occurred outside of the City of Missoula, the City continues to attract most of the area's new businesses and jobs, and continues to be the focus of most employment- and commerce- related travel.

TABLE 7-2
Historic Employment Trends
Missoula County 1940-1996

Year	County Employment
1940	11,326
1950	18,449
1960	22,485
1970	25,099
1980	39,387
1990	46,913
1996	57,500*

* 1996 employment is estimated
Sources: U.S. Department of Commerce, Bureau of the Census, Census of Population, 1940-1990.

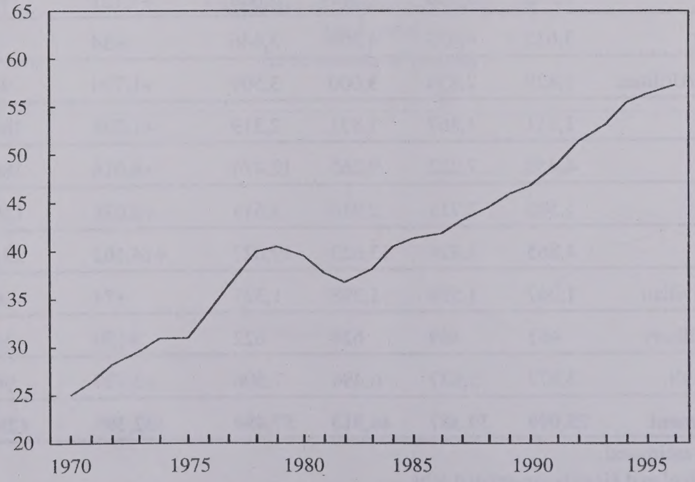
Importantly, Missoula's employment is growing more rapidly than its population. From 1970 through 1996, the county population is estimated to have grown by 54%; county-wide employment is estimated to have grown by 129%. Population growth has been averaging about 2% a year, while employment growth is averaging about 5% a year.

There are several factors causing employment in Missoula County to grow more rapidly than population. Overall labor participation for county residents increased from 57% to 66% between 1970 and 1990. This transition was most notably affected by increases in labor force participation by women. In 1970, 42% of Missoula County women were in the labor force compared to 60% in 1990 (the labor force participation rate for males changed little from 1970-1990). Another factor contributing to county job growth was development of many part-time jobs. Much of Missoula's job growth has been in the Retail and Service Sectors, where employers have been increasing their reliance on part-time workers. A final major contributor to faster growth in employment relative to population is expansion of the numbers of Ravalli, Lake, and Sanders County residents commuting to jobs in Missoula. Increasingly, parts of these counties serve as Missoula bedroom communities.

Recent Employment Trends 1970-1996

FIGURE 7-2 displays recent trends in average annual employment in Missoula County from 1970 through 1996. Of particular interest is the pattern of long-term growth in county-wide employment. **FIGURE 7-2** also graphically illustrates the vulnerability of Missoula's economy to intervals of little or no growth. In the early 1980s, the Missoula economy experienced a period of declining employment.

FIGURE 7-2
Recent Employment Trends
Missoula County 1970 - 1996
(in thousands of people)



* 1993, 1994, 1995, and 1996 employment figures are estimated.
Source: U.S. Department of Commerce, Bureau of Economic Analysis

Recent Economic Trends By Sector

TABLE 7-3 illustrates 1970-1996 employment patterns in major economic sectors. During the 26-year period the Missoula economy added over 30,000 jobs. Service, Retail and Government sectors account for most of the increases in employment in Missoula County during this period. Of importance to transportation planning is that retail and service businesses tend to generate more trips per worker than most other business types.

TABLE 7-3
Employment Trends by Categories of Employment and Economic Sector
Missoula County 1970-1996

	1970	1980	1990	1996*	1970-96 Net Change	1970-96 %Change
Farming	306	496	533	554	+248	81%
Ag. Services, Forestry	197	203	453	624	+427	217%
Mining	12	167	81	68	+56	467%
Construction	1,542	2,726	2,177	2,663	+1,121	73%
Manufacturing	3,612	4,653	4,504	3,646	+34	1%
Transportation/Utilities	1,829	2,854	3,000	3,599	+1,770	97%
Wholesale	1,111	1,867	1,851	2,319	+1,208	109%
Retail	4,458	7,222	9,265	12,474	+8,016	180%
Finance	1,580	2,711	2,910	3,618	+2,038	129%
Services**	4,865	8,824	13,623	19,027	+14,162	291%
Fed. Gov't., Civilian	1,247	1,558	1,398	1,321	+74	6%
Fed. Gov't., Military	463	469	624	622	+159	34%
State/Local Gov't.	3,877	5,637	6,494	7,606	+3,729	96%
Total Employment	**25,099**	**39,387**	**46,913**	**57,494**	**+32,395**	**129%**

* 1996 data are estimated

**Includes Medical and Healthcare-related jobs

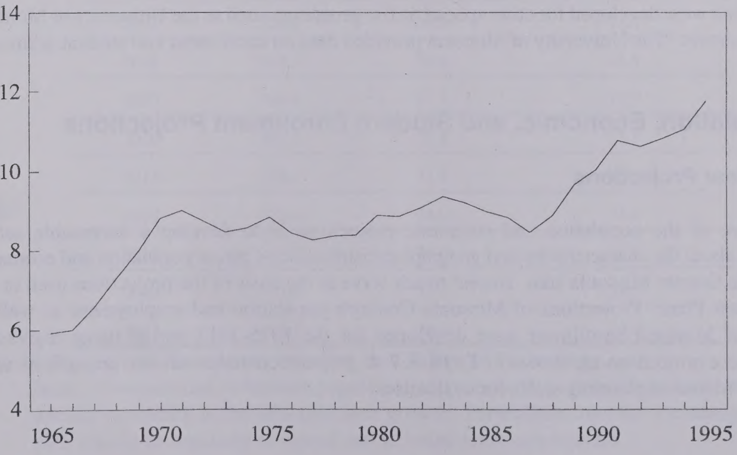
Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, 1995.

7.2 University of Montana Enrollment

The University of Montana is the single greatest trip generator in the Missoula transportation planning area. The University employment, enrollment, and student housing data are important inputs in to the modeling of Missoula area travel patterns. **FIGURE 7-3** depicts fall enrollments at the University from 1965 through 1995. University enrollments grew rapidly in the late 1960s and early 1970s; remained fairly stable in through remainder the 1970s and much of the 1980s. In the late 1980s and into the 1990s the University is experiencing another period of growth in enrollment.

University of Montana enrollment trends are influenced foremost by demographics of the state and national populations. Enrollment growth in 1960s reflects the maturation of the "Baby Boomer" generation to college age. Enrollment growth in the late 1980s and 1990s reflects the maturation of the children of "Baby Boomers" to college age. Times of immigration to Montana coincide with periods of enrollment growth at the University. Another factor causing growth in enrollment has been the increase in part-time students. In fall of 1995, University enrollment was 11,753, composed of 9,526 full-time students and 2,227 part-time students. Enrollment totals for 1995 are also buoyed by inclusion of students attending the College of Technology. In prior years these students were not counted as university enrollees.

FIGURE 7-3
University of Montana Enrollment
1965-1995
(in thousands of people)



7.3 Initializing the Transportation Model for 1994

The base year for the Missoula Transportation Plan is 1994, which was the most recent year for which necessary traffic count, population and economic data were available. The QRS-II Transportation Model uses socioeconomic characteristics to predict the frequency of travel between each Transportation Analysis Zones (TAZ) and external entry point. Baseline socioeconomic information characterizes and quantifies residential, business, government, and other special (trip-generating) land uses in each of 284 (TAZs) within the Missoula Transportation Planning Area. Data was also developed for the six external analysis areas (which cover outlying areas of Missoula County except for the Seeley-Swan Valley).

Census data was used to develop detailed information on population, housing units, household sizes, and household income characteristics within each transportation zone. Population and housing data was then updated through 1994 using permit data for new residences available from the City of Missoula, Missoula County and the State of Montana.

The QRS-II Model uses 13 different employer/business categories to predict employment- and commerce-related trip productions and attractions. Business and employment data for 1994 was provided by the Montana Department of Labor and Industry and the US Department of Commerce. First the data was adjusted for full-time equivalent employment and allocated into individual TAZs. Then, using the federal governments Standard Industrial Classification codes (SIC codes) and input from Missoula planners, employment data was re-aggregated into the trip generation categories used in the transportation modeling.

Additional data were developed for other special traffic generators such as the University of Montana and public schools. The University of Montana provided data on enrollment and student addresses for 1994.

7.4 Population, Economic, and Student Enrollment Projections

7.4.1 20-Year Projections

The objective of the population and economic projections is to develop a reasonable set of assumptions about the characteristics and geographic distribution of future population and economic activity in the Greater Missoula area. Recent trends serve as the basis of the projections used in the Transportation Plan. Projections of Missoula County's population and employment as well as University of Montana enrollment were developed for the 1995-2015 period using regression analysis. These projections are shown in **TABLE 7-4**. Population and economic projections were presented to Missoula planning staffs for evaluation.

TABLE 7-4
Summary of Missoula County Projections 1995-2015
Population, Employment, and University of Montana Enrollment
(in thousands of people)

Year	Population	Employment	U of M Enrollment*
1995	88.1	56.4	11.9
1996	89.9	57.5	12.0
1997	91.2	58.6	12.1
1998	92.5	59.7	12.3
1999	93.8	60.8	12.4
2000	95.1	61.9	12.5
2001	96.3	62.9	12.6
2002	97.6	64.0	12.8
2003	98.9	65.1	12.9
2004	100.2	66.2	13.0
2005	101.5	67.3	13.1
2006	102.8	68.4	13.3
2007	104.0	69.5	13.4
2008	105.3	70.6	13.5
2009	106.6	71.7	13.7
2010	107.9	72.8	13.8
2011	109.2	73.8	13.9
2012	110.4	74.9	14.0
2013	111.7	76.0	14.2
2014	113.0	77.1	14.3
2015	114.3	78.2	14.4

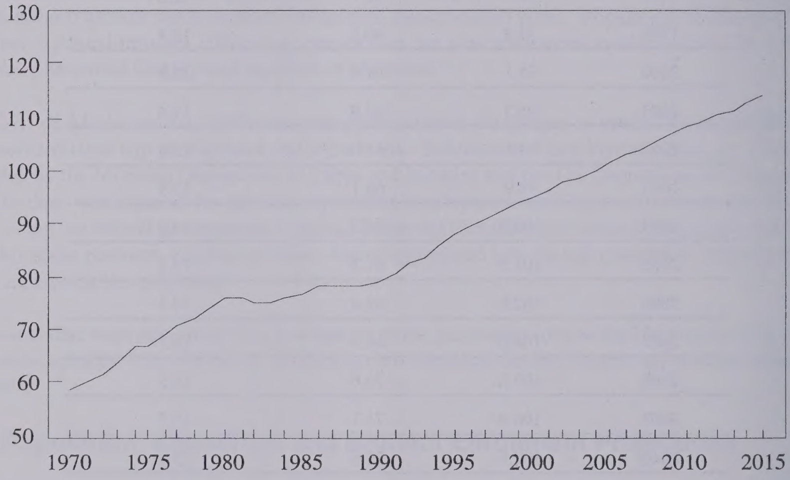
* Figures include students attending the College of Technology.

Note: Comparisons of historic population and economic patterns reveals decade-to-decade variability in the Missoula area growth. Projections used for the transportation plan should be regularly reviewed and adjusted when appropriate.

7.4.2 Population Projections

The Missoula County population is predicted to grow by about 26,000 during the 1995-2015 planning period. In 2015, the population of Missoula County is expected to exceed 114,000. For purposes of comparison, the Missoula County's population increased by 20,000 people in the 1975-1995 period. **FIGURE 7-4** is a visual representation of historical and projected population trends.

FIGURE 7-4
Population Trends & Projections
Missoula County 1970 - 2015
(in thousands of people)

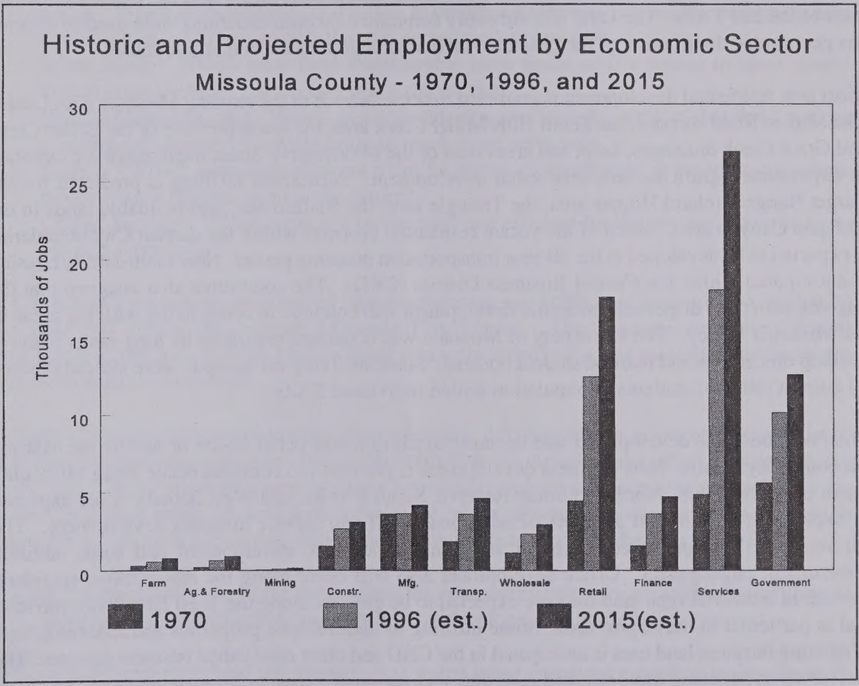


7.4.3 Employment Projections

Employment in the Missoula area will continue to grow more rapidly than Missoula's population. During the remainder of the 1990s, and early next century, a large portion of Missoula County's population will be in working age groups (16-65). In addition, further suburbanization in neighboring counties will continue to spur commuting to jobs in Missoula by out-of-county residents. The projected growth in employment has important implications for Missoula transportation planning. Work trips tend to be concentrated in a few hours a day; and the substantial job growth will exacerbate capacity problems during times of peak travel.

FIGURE 7-5 displays historic and projected employment by economic sector. The Service and Retail sectors are predicted to account for the greatest shares of Missoula's overall employment growth. Again, the Retail and Service sectors tend to generate higher levels of traffic per job than do most other economic sectors.

FIGURE 7-5



7.4.4 Baseline Land Use Projections

A Land Use Advisory Committee was formed to allocate projected growth within the Missoula Transportation Planning area. The committee was composed of staff planners from the Missoula Office of Planning and Grants and Missoula County, as well as public and private utility infrastructure managers familiar with ongoing development patterns in the "Greater Missoula Area". The committee's charge was to analyze land use trends and predict future land use characteristics for each of the 284 TAZs. The Land Use Advisory committee recommendations were used to allocate the geographic distribution of the projected increases in population and employment.

Most new residential development is predicted to occur outside of the existing Missoula City Limits. The Mullan Road corridor, the South Hills/Miller Creek area, the lower portions of the Butler Creek and Grant Creek drainages, Lolo, and areas west of the I-90/Reserve Street Interchange are expected to experience significant new residential development. Substantial infilling is predicted for the Target Range-Orchard Homes area, the Triangle area, the Rattlesnake, and buildable lands in the Hellgate Canyon area. Much of the vacant residential property within the current City boundaries is expected to be developed in the 20-year transportation planning period. New multi-family housing is anticipated within the Central Business District (CBD). The committee also assumed that the ongoing pattern of dispersed residential development will continue to occur in the outlying areas of the Missoula Valley. The University of Montana was consulted regarding its long-range plans to develop on-campus and married student housing. Students living off-campus were allocated based on current ratios of students to population within individual TAZs.

Most new business development and business expansion will occur inside or nearby the existing Missoula City Limits. New business development is predicted to continue occur along Missoula's major travel corridors. North and South Reserve, South Brooks, and West Broadway are expected to experience the greatest amounts of additional retail and service business development. The Missoula CBD is predicted to attract additional office type development and some addition government employment. Office development also will occur along the major travel corridors. Growth in industrial type land uses are expected to be greatest along the West Broadway corridor, and in particular in the airport area. Some infilling of undeveloped properties and redevelopment of existing business land uses is anticipated in the CBD and other established business districts. The University of Montana was consulted regarding its long-range plans for improvements to its campus area and other University properties.

7.4.5 Growth Management Projections

In addition to the Baseline Land Use projections, a "Growth Management" land use scenario was developed with the assistance of the Missoula planning staff. An objective of Growth Management is to reduce impacts of "urban sprawl"-type land uses by concentrating development in a few growth areas. The Growth Management Task Force identified several issues and concerns that assisted in the selection of such areas within Missoula. Those issues were:

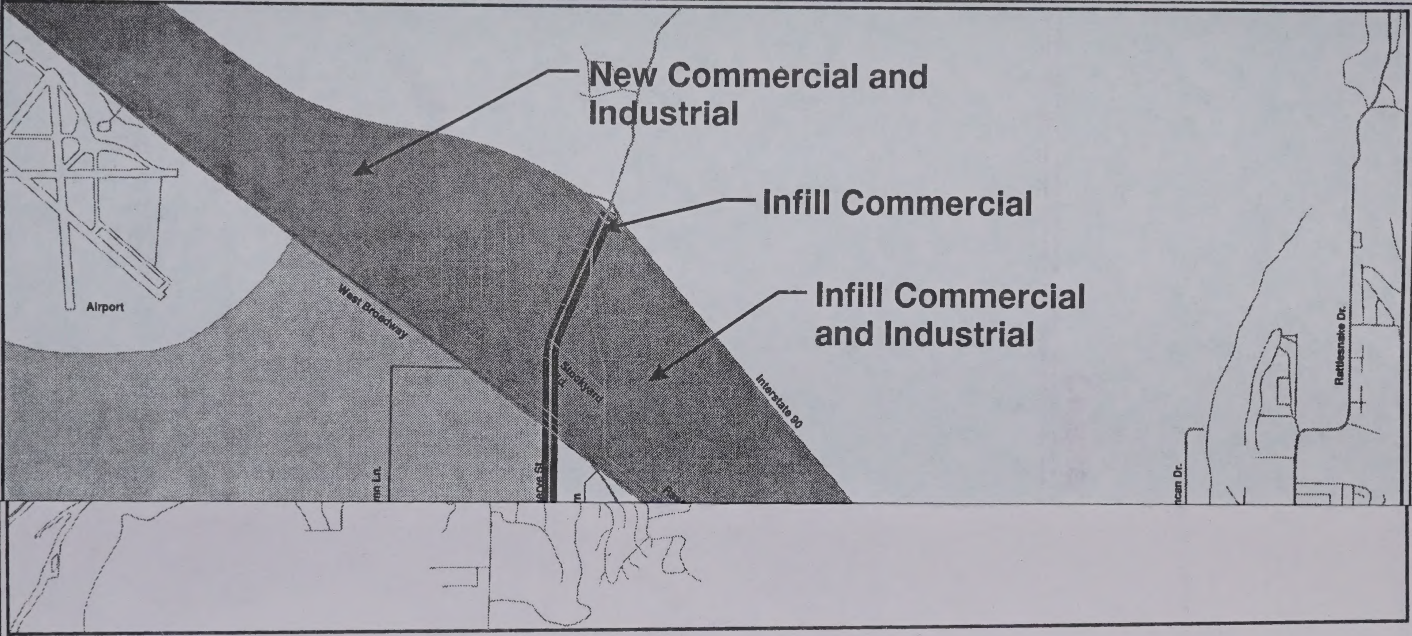
- Transportation - Which areas would require the least number of transportation system improvements or provide more non-motorized alternatives?
- Air Quality - Which areas would have the least impact on the quality of the air in the valley?
- Water Quality - Which areas are or could be accessible to city sewer prior to development? Where would it be least expensive to provide sewage treatment?
- Social - Which areas provide good access to community services, are central to employment opportunities, and near schools that can accommodate growth?
- Open Space - Which areas have considerable open space and/or access to open space? Which areas provide critical open space resources?
- Vehicle Miles Traveled - Which areas provide opportunities for services that don't require a significant number of vehicle miles to reach those services?
- Schools - Which areas currently have room for increased enrollment, or based on consultant projections, will have room in the future?
- Cost of Services - Which areas will be the most cost efficient for the city and community to provide services to?

The Consultant's projections emphasized new development and infilling of undeveloped residential areas near and within the existing Missoula City Limits. The Triangle area, the Orchard Home/Target Range area, and the Mullan Road area were identified as the most ideal locations for future residential development.

An effect of successfully concentrating new residential development in a few areas would be to reduce residential development elsewhere in Missoula County. An additional effect of concentrating growth would be to encourage new business investment in business locations accessible to the targeted residential areas. Adjustments were made in the allocation of commercial land uses to account for the shifts in population distribution attributable to Growth Management.

FIGURE 7-6 graphically shows the areas within the community that were identified for infilling as well as areas where new residential and commercial development should be encouraged.

The Growth Management land use scenario was tested using computer modeling to determine its effects on traffic volumes in the year 2015. The model test run indicated that this scenario would result in modest increases in traffic volumes within the city limits and a modest decrease in traffic volumes in the outlying areas. It also resulted in an overall reduction in the total vehicle miles traveled within the community and a small increase in the number of trips made by alternative modes. More information relating to the results of the model test run of the Growth Management land use scenario is presented in Section 8.9 of this document (Test Run #6, page 8-12).



Map - Not To Scale

Areas Identified for Infilling and New Development Based on Growth Management Goals

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Figure 7-6
Areas Identified for Infilling and New Development

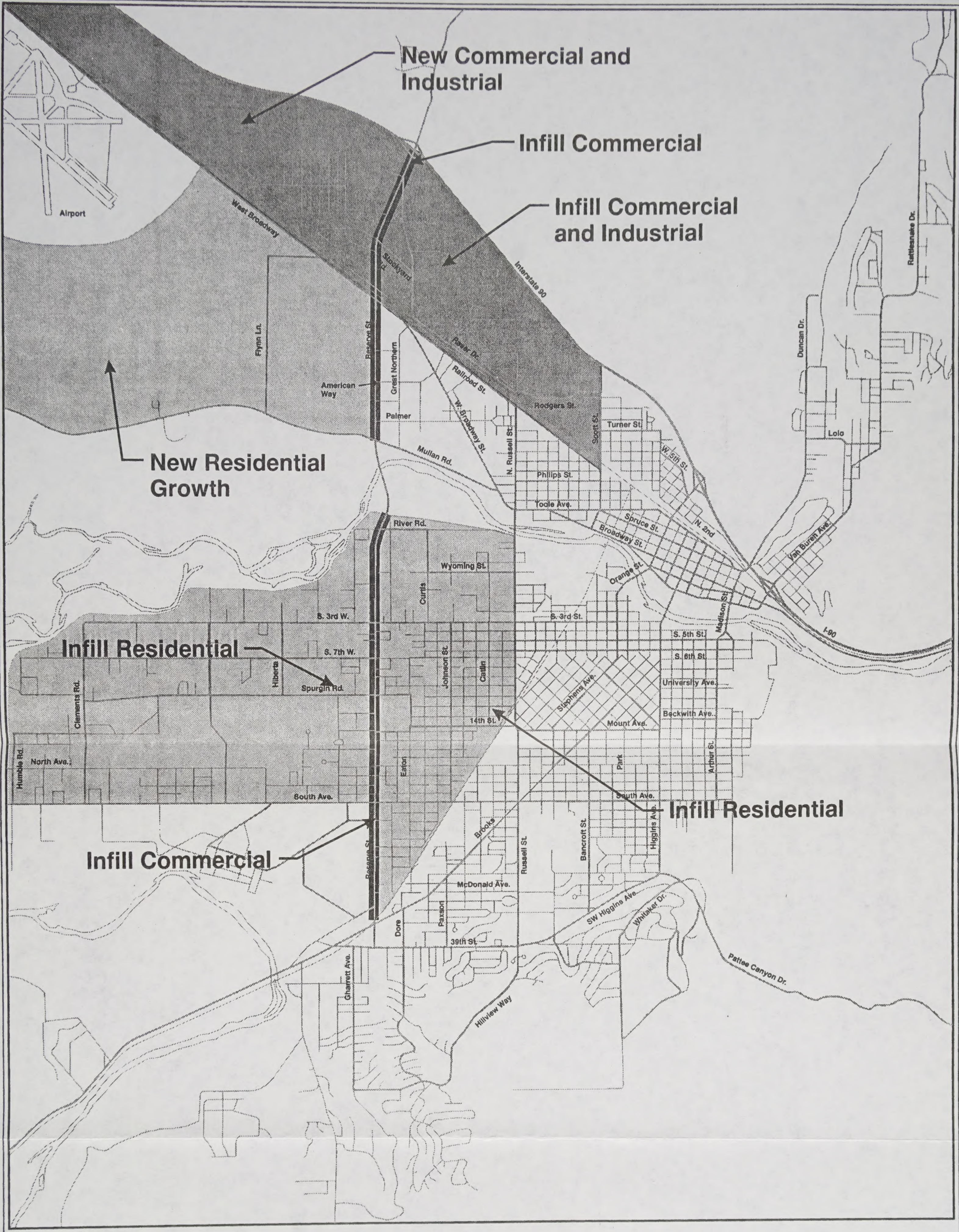

Figure 7-6
Areas Identified for Infilling and New Development

Areas Identified for Infilling and New Development Based on Growth Management Goals

Map - Not To Scale

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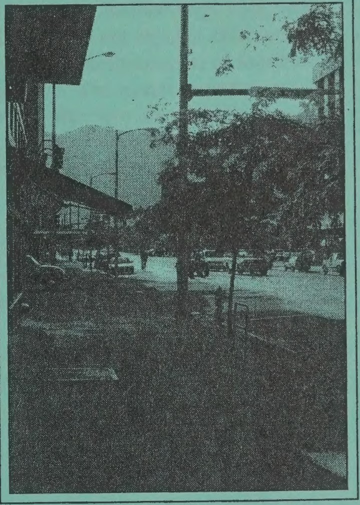
Chapter 8: Travel Demand Forecasting



8.0 Travel Demand Forecasting

8.1 Traffic Forecast Model

The Missoula Area Transportation Model utilizes the current versions of Quick Response System II (QRS-II for Windows, Version 4.0) and the General Network Editor (GNE for Windows, Version 5.0) software programs developed by AJH Associates, Milwaukee, Wisconsin.

Traffic forecasts for the Missoula Area have been estimated using the methodology commonly applied in motorized vehicle demand forecasting. The QRS-II model is not capable of accurately forecasting transit, pedestrian or bicycle activity. This methodology primarily consists of four basic steps: trip generation, trip distribution, mode split and trip assignment. The model generates person trips as a function of land use activity, links these person trips together into an origin-destination (OD) matrix for the entire study area, separates transit trips and applies auto occupancy factors to estimate auto vehicle trips, and assigns the auto and transit trips to the coded highway and transit networks.

The Missoula model has two major components. First, there is a trip generation workbook which is modified and executed with Microsoft EXCEL or similar spreadsheet software package. This trip generation workbook contains user defined land use data, and calculates the resulting number of trips in each Transportation Analysis Zone in the network. Second, there is a QRS-II model containing the Missoula highway and transit network. Various network components can be input or modified with the GNE software program, which comes with the QRS-II software package. The model is executed with the QRS-II software program.

8.2 Model Development

The Missoula Transportation Model was developed in the following manner. First, the roadway and transit network to be evaluated was compiled and a Transportation Analysis Zone (TAZ) system developed for the study area. Land use data for the study area was compiled by TAZ and input into the trip generation spreadsheet. This trip generation spreadsheet estimates productions and attractions (P's and A's) for each TAZ in the study area. QRS-II distributes these trips among the TAZs based on their attractiveness and proximity to each other, resulting in a matrix containing trips to and from each TAZ. QRS-II then estimates the trips which will utilize the transit system and separates them from auto trips. Auto occupancy factors are applied to calculate the auto vehicle trip matrix. Finally, QRS-II assigns these auto trips to the model roadway network and the transit trips to the transit network. The output of a model run is an estimate of traffic volumes for each roadway and transit link within the study area during an average weekday.

8.3 Model Runs

A series of model runs was performed during the Missoula Transportation Plan Update. First, an existing 1994 model was developed and validated to existing 1994 traffic conditions. This existing model is based on land use data, roadway and transit data, and roadway and transit count data compiled in 1994 for the Missoula area. Future land use projections for the years 2005 and 2015 were developed for the study area. An Existing plus Committed network was developed based on the existing roadway network plus committed improvements outside of the air quality non-attainment areas. Alternate future roadway networks were developed to analyze impacts of various potential improvement scenarios. Finally, a recommended roadway network improvement scenario was developed.

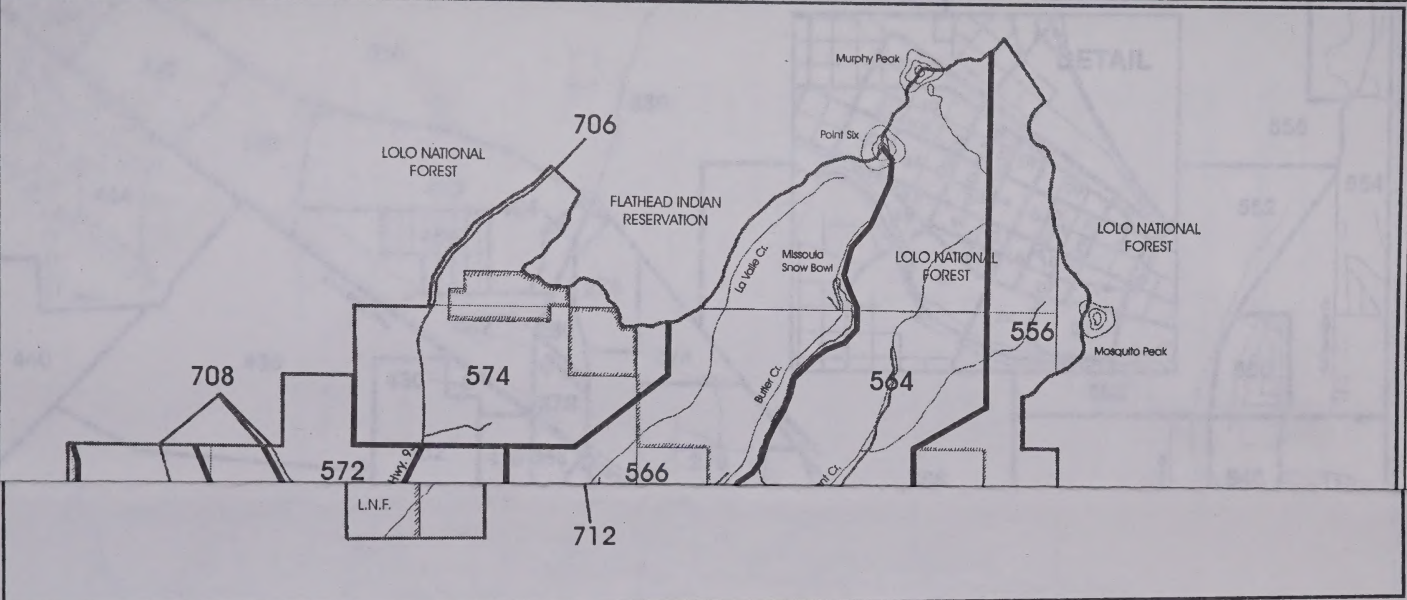
The first model run includes the existing 1994 highway and transit network and 1994 land use data. This model run attempts to replicate existing network conditions found in Missoula based on 1994 roadway counts and available transit patronage data. These existing 1994 model results are compared to 1994 counts, individually and along a set of screen lines around the study area, in a process called model validation. A spreadsheet was developed to assist in this comparison of model results and ground counts. The 1994 existing model results were well within the Montana Department of Transportation (MDT) standards for validation.

A series of model runs were also performed to estimate various future scenarios. Types of Highway networks include Existing (E), Existing plus Committed (C), Alternative (A), and Recommended (R). Land use scenarios were developed for the years 1994 (existing), 2005 and 2015.

8.4 Transportation Analysis Zones

The transportation model for Missoula divides the study area into 284 internal TAZs and 6 external stations. Even numbers are initially used for all TAZs, leaving odd numbers for future zone splitting. The existing network utilizes TAZ numbers 2 thru 574 for its 284 internal zones, and TAZ numbers 702 thru 712 for the six external stations. TAZs contain land use data representing existing or future development. All trips assigned by the model originate from or are destined to a TAZ.

FIGURES 8-1 and **8-2** show the 1994 existing network TAZs in the rural, urban and downtown portions of the study area. In addition to zones within the Missoula study area, external stations (or gateways) were established to account for trips which either originate or terminate outside of the study area (internal-external and external-internal trips) or simply drive through the study area (external-external trips).



Transportation Analysis Zone Map - Rural Area

LEGEND

▬ Zone Boundary
510 Zone Number

Map - Not To Scale

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URBAN AREA TRANSPORTATION
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Figure 8-1
Transportation Analysis
Zone Map - Rural Area

8.3 Model Runs

A series of model runs was performed during the Missoula Transportation Plan Update. First, an existing 1994 model was developed and validated to existing 1994 traffic conditions. This existing model is based on land use data, roadway and transit data, and roadway and transit count data compiled in 1994 for the Missoula area. Future land use projections for the years 2005 and 2015 were developed for the study area. An Existing plus Committed network was developed based on the existing roadway network plus committed improvements outside of the air quality non-attainment areas. Alternate future roadway networks were developed to analyze impacts of various potential improvement scenarios. Finally, a recommended roadway network improvement scenario was developed.

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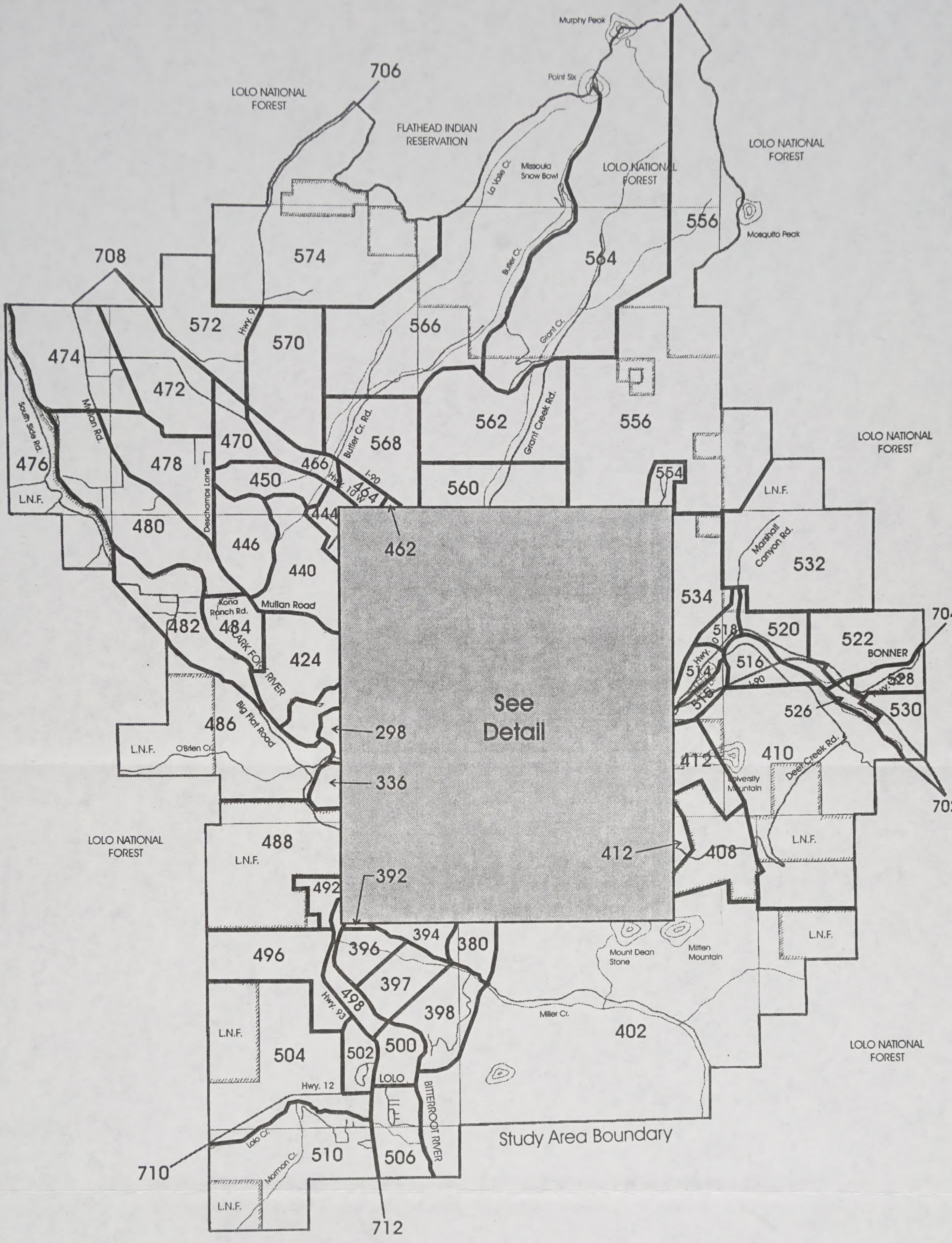

Figure 8-1
Transportation Analysis
Zone Map - Rural Area

Transportation Analysis Zone Map - Rural Area

LEGEND

▬ Zone Boundary

510 Zone Number

Map - Not To Scale

N

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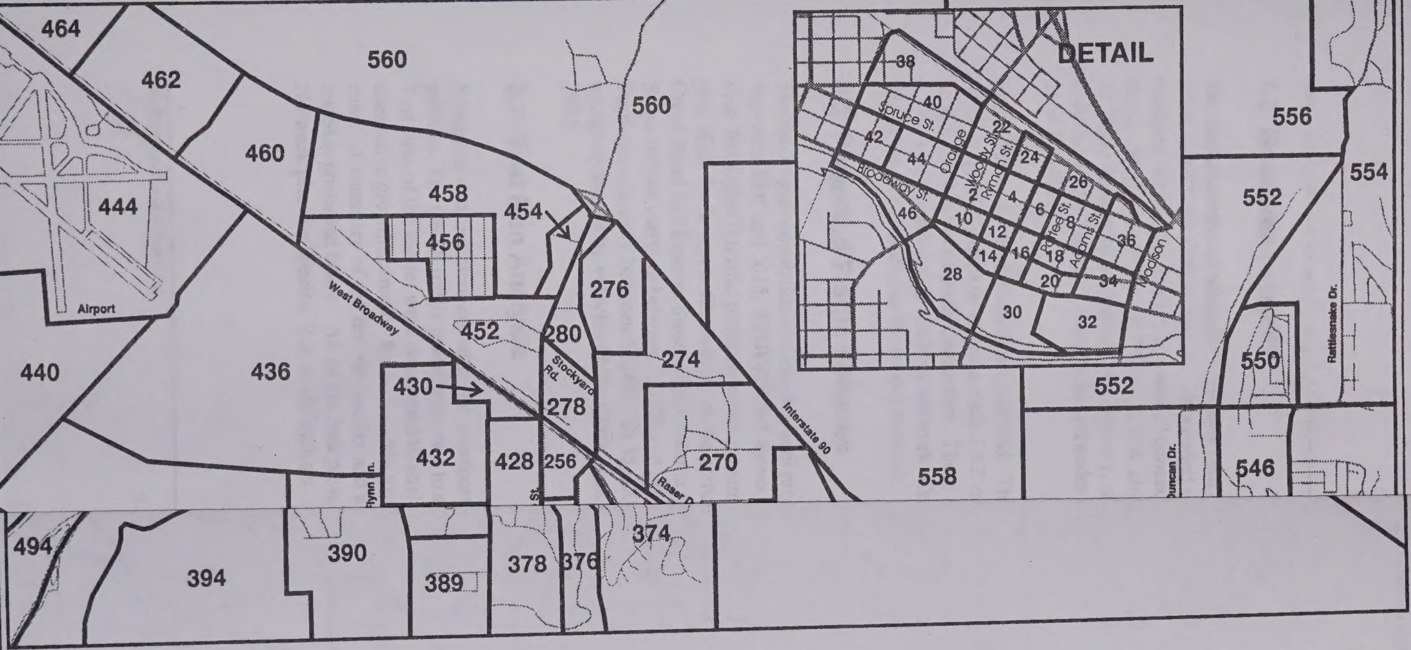
URBAN AREA TRANSPORTATION PLAN UPDATE - 1996



Map - Not To Scale

Transportation Analysis Zone Map - Urban Area

LEGEND

▬	Zone Boundary
332	Zone Number

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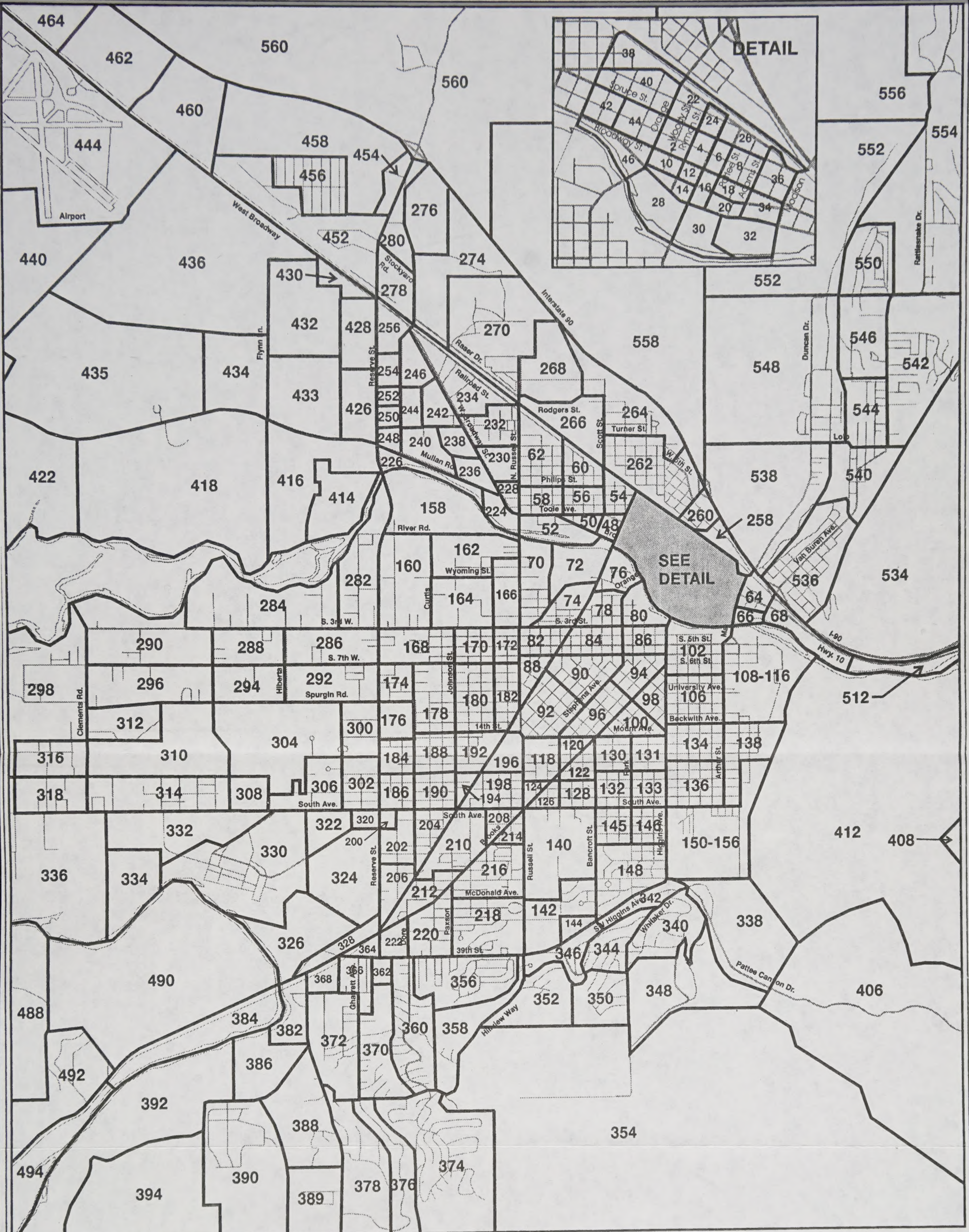
PLAN UPDATE - 1996

Figure 8-2
Transportation Analysis
Zone Map - Urban Area



Map - Not To Scale

N

Transportation Analysis Zone Map - Urban Area

LEGEND

—— Zone Boundary

332 Zone Number

Figure 8-2
Transportation Analysis
Zone Map - Urban Area

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PLAN UPDATE - 1996

8.5 Roadway Network

The characteristics of Missoula's roadway system are input into the traffic model as a computerized network with the GNE software. This coded network consists of a set of "links", which represent roadway network segments or centroid connectors, and "nodes", which represent intersections or bends along a roadway and TAZs. A link always has a node at each end. Each link is assigned attributes such as speed, travel time, capacity, and functional classification to define it's operational characteristics. Together, these links and nodes define the continuity of the roadway network for the QRS-II model.

Each TAZ in the model contains a centroid. These centroids represent the location of the origin or destination of all trips to or from each TAZ or external station. An important component of the model network are centroid connectors. These are links which connect each centroid (representing a TAZ) to the adjoining roadway network. Centroid connectors implicitly represent local streets which are not included in the model network.

8.6 Projected Traffic Volumes

The future year population and employment projections were used to develop traffic projections for the years 2005 and 2015. **FIGURE 8-3** shows traffic projections for the year 2005(E+C), while the year 2015 (E+C) traffic projections are presented in **FIGURE 8-4.** The data indicates that by the year 2015 the largest traffic volume in the community will occur on Brooks between Lower Miller Creek Road and Reserve Street with a volume of 43,200 vehicles per day (VPD). Most of Reserve Street will be carrying between 35,000 and almost 40,000 VPD, and Brooks between Reserve and Stephens will carry between 32,000 and 35,000 VPD. In the year 2015 there will be over 150,000 bridge crossings by vehicles of the Clark Fork River every day compared to 110,000 crossings in 1994.

8.7 Test Run Analysis

Problems and deficiencies with the transportation system were identified during the planning process. The QRSII traffic model was used to examine possible modifications to the road network. Test runs of the model were developed to analyze to impacts of 18 possible road changes and one alternative growth scenario. It was possible to combine all of the possible road changes into six test runs. A summary of the test run results and a discussion on the impacts of the road alternatives tested is presented below. All of the data presented below is based on the year 2015 with the E+C Network plus the specific link modifications.

Test Run #1

Description: This test run included the following road changes:

- North Reserve Street (S. 3rd to I-90) - widen to 4-lanes S. 3rd to Mullan and 5-lanes Mullan to I-90
- Higgins/SW Higgins/39th - Widen to 3-lanes (except 5-lanes Russell to Bancroft)
- New Linda Vista Bridge (Blue Mountain Alignment)

Results: The impacts of the road changes tested in this test run are summarized below.

1. N. Reserve 3rd to I-90 - Widen (4-lanes 3rd to Mullan, 5-lanes Mullan to I-90)

☐ adds 5000- 6000 VPD to N. Reserve
☐ adds 500-1500 VPD to Reserve between Brooks and 3rd
☐ subtracts 1000 VPD from W. Broadway - west of Reserve
☐ subtracts 2500 VPD from Broadway between Russell and Reserve
☐ subtracts 2200 VPD from Russell Bridge
☐ subtracts 1000 VPD from Russell - south of 3rd
☐ subtracts 500 VPD from Orange St. Bridge

This test run indicates that the widening of North Reserve Street will have an overall positive impact on the other arterials in that area of the community.

2. Higgins/SW Higgins/39th - Widen to 3-lanes (except 5-lanes Russell to Bandcroft)

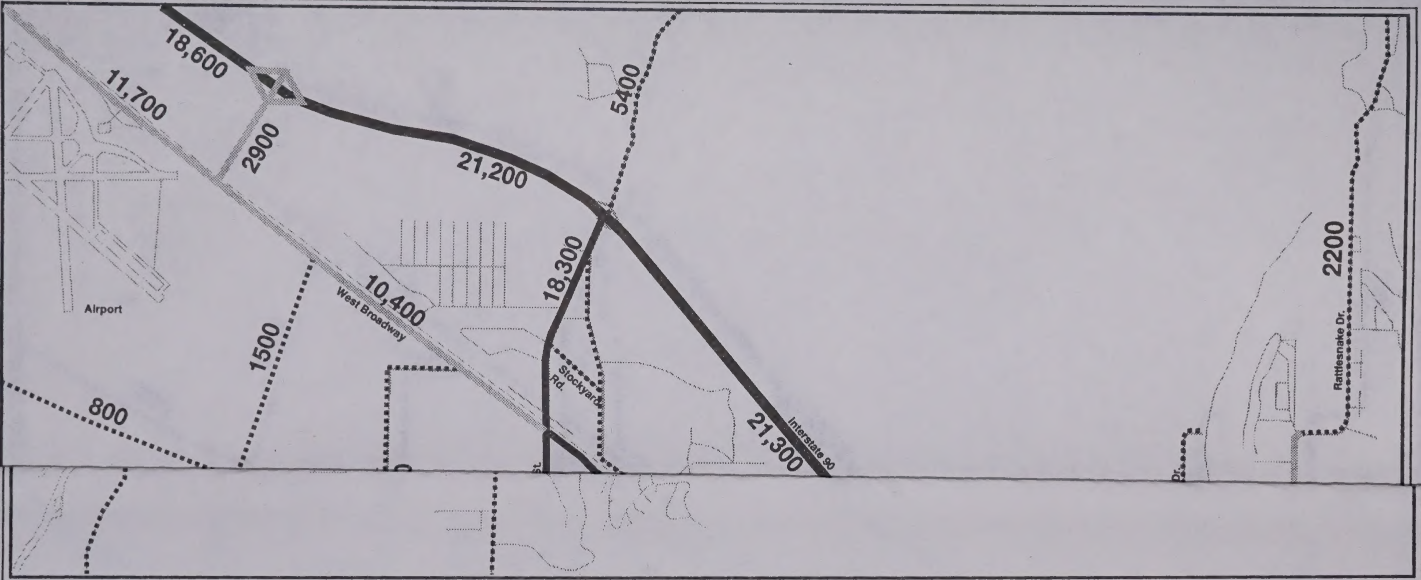
☐ adds 4000 VPD to 39th
☐ adds 4500 VPD to SW Higgins - Russell to Pattee Canyon
☐ adds 4000- 4500 VPD to Higgins - Pattee Canyon to Brooks
☐ no change north of Brooks on Higgins
☐ subtracts 4000- 5000 VPD from Brooks - Higgins to Stephens
☐ subtracts 1500 VPD from Brooks - Stephens to Russell
☐ subtracts 2000-3000 VPD from Brooks - Russell to Reserve
☐ subtracts 1000 VPD from Russell - Brooks to 39th

This test run indicates that the widening of the Higgins/SW Higgins/39th corridor will have an overall positive impact on the other arterials in that area of the community. This improvement will help keep traffic on the arterial system and off of neighborhood streets.

3. New Linda Vista Bridge (Blue Mountain Road Alignment)

☐ 2200 on new bridge
☐ adds 1300 to 93 - Blue Mountain to Miller Creek
☐ subtract 1500 from Lower Miller Creek
☐ no change on Upper Miller Creek
☐ no change on Blue Mountain

The addition of a bridge at this location is considered to be of questionable benefit to the area road network.



Projected Traffic Volumes
(2005 E+C)

LEGEND

- ▬ Interstate
- ▬ Principal Arterial
- ▨ Arterial
- ⋯ Collector
- 13,200 Average Daily Traffic Volume

Map - Not To Scale

N

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Figure 8-3
Projected Traffic Volumes
(2005 E+C)

Test Run #1

Description: This test run included the following road changes:

- North Reserve Street (S. 3rd to I-90) - widen to 4-lanes S. 3rd to Mullan and 5-lanes Mullan to I-90
- Higgins/SW Higgins/39th - Widen to 3-lanes (except 5-lanes Russell to Bancroft)
- New Linda Vista Bridge (Blue Mountain Alignment)

Results: The impacts of the road changes tested in this test run are summarized below.

1. N. Reserve 3rd to I-90 - Widen (4-lanes 3rd to Mullan, 5-lanes Mullan to I-90)

☐ adds 5000- 6000 VPD to N. Reserve
☐ adds 500-1500 VPD to Reserve between Brooks and 3rd
☐ subtracts 1000 VPD from W. Broadway - west of Reserve
☐ subtracts 2500 VPD from Broadway between Russell and Reserve
☐ subtracts 2200 VPD from Russell Bridge
☐ subtracts 1000 VPD from Russell - south of 3rd
☐ subtracts 500 VPD from Orange St. Bridge

This test run indicates that the widening of North Reserve Street will have an overall positive impact on the other arterials in that area of the community.

2. Higgins/SW Higgins/39th - Widen to 3-lanes (except 5-lanes Russell to Bandcroft)

☐ adds 4000 VPD to 39th
☐ adds 4500 VPD to SW Higgins - Russell to Pattee Canyon
☐ adds 4000- 4500 VPD to Higgins - Pattee Canyon to Brooks
☐ no change north of Brooks on Higgins
☐ subtracts 4000- 5000 VPD from Brooks - Higgins to Stephens
☐ subtracts 1500 VPD from Brooks - Stephens to Russell
☐ subtracts 2000-3000 VPD from Brooks - Russell to Reserve
☐ subtracts 1000 VPD from Russell - Brooks to 39th

This test run indicates that the widening of the Higgins/SW Higgins/39th corridor will have an overall positive impact on the other arterials in that area of the community. This improvement will help keep traffic on the arterial system and off of neighborhood streets.

3. New Linda Vista Bridge (Blue Mountain Road Alignment)

☐ 2200 on new bridge
☐ adds 1300 to 93 - Blue Mountain to Miller Creek
☐ subtract 1500 from Lower Miller Creek
☐ no change on Upper Miller Creek
☐ no change on Blue Mountain

The addition of a bridge at this location is considered to be of questionable benefit to the area road network.

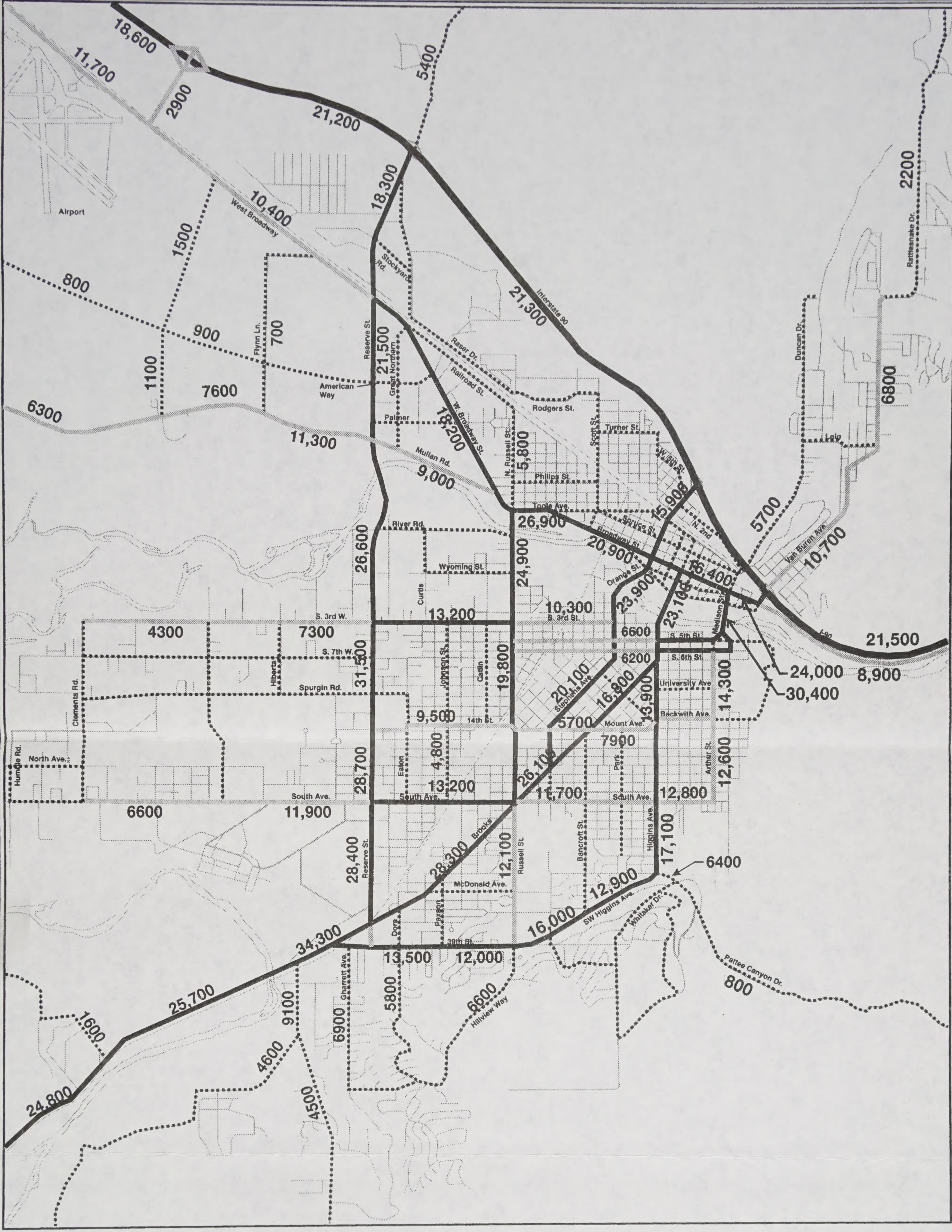

Figure 8-3
Projected Traffic Volumes
(2005 E+C)

Projected Traffic Volumes
(2005 E+C)

LEGEND

- Interstate
- Principal Arterial
- Arterial
- Collector
- 13,200 Average Daily Traffic Volume

Map - Not To Scale

N

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URBAN AREA TRANSPORTATION
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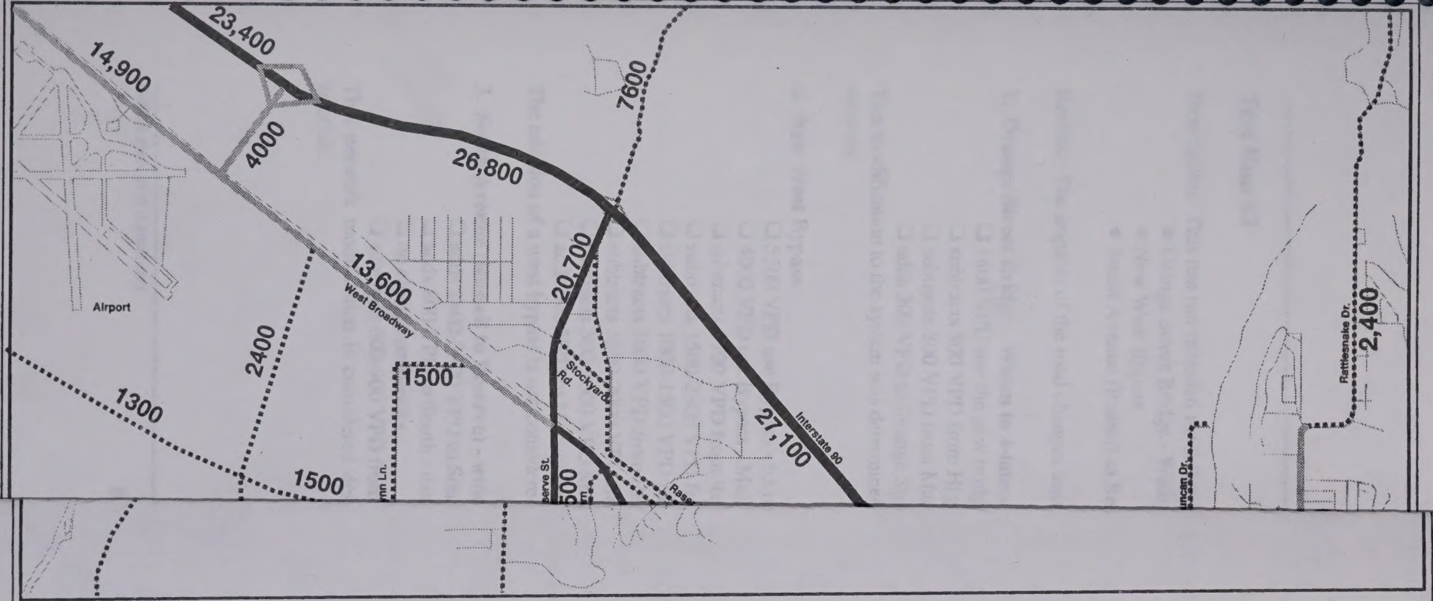

Projected Traffic Volumes (2015 E+C)

LEGEND

▬	Interstate
▬	Principal Arterial
▨	Arterial
┈	Collector
6500	Average Daily Traffic Volume

Map - Not To Scale

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URBAN AREA TRANSPORTATION
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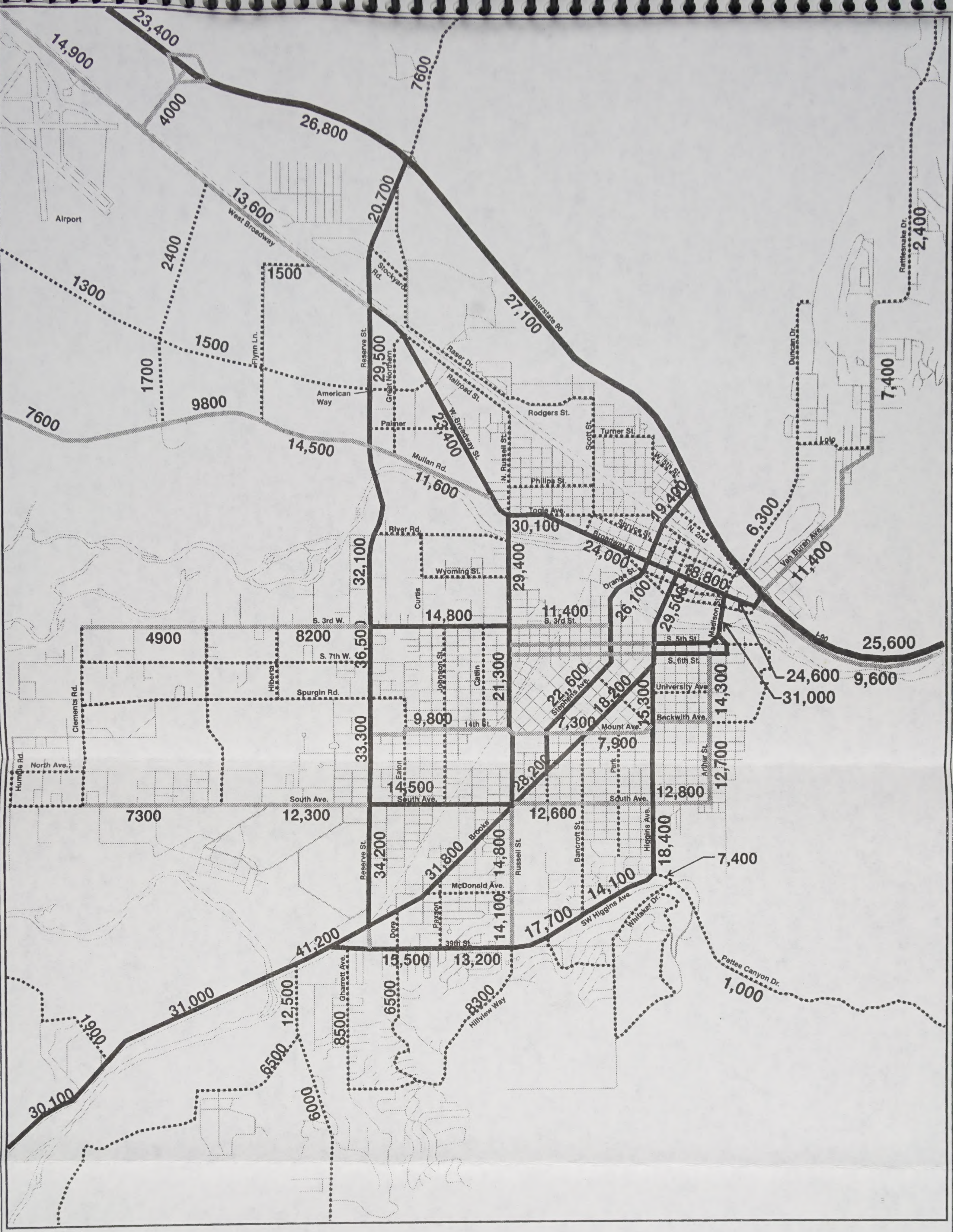
Figure 8-4
Projected Traffic
Volumes (2015 E+C)



Projected Traffic Volumes (2015 E+C)

LEGEND

Interstate
Principal Arterial
Arterial
Collector
6500 Average Daily Traffic Volume

Map - Not To Scale

N

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URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996

Figure 8-4
Projected Traffic
Volumes (2015 E+C)

Test Run #2

Description: This test run included the following road changes:

- Orange Street Bridge - Widen to 4-lanes
- New West Bypass
- South Avenue (Russell to Reserve) - Widen to 3-lanes

Results: The impacts of the road changes tested in this test run are summarized below.

1. Orange Street Bridge - Widen to 4-lanes

☐ 1800 VPD use the new bridge
☐ subtracts 800 VPD from Higgins St. Bridge
☐ subtracts 800 VPD from Madison Bridge
☐ adds 300 VPD to Orange Street Underpass

This modification to the system was determined to be very beneficial to the overall community road network.

2. New West Bypass

☐ 5500 VPD use Bypass - 93 north to Mullan
☐ 4000 VPD use Bypass - Mullan north to W. Broadway
☐ subtracts 1700 VPD from Reserve St. Bridge
☐ subtracts 1500-2300 VPD from Reserve S.3rd to 93
☐ subtracts 1000-1500 VPD from Reserve - Mullan to Broadway
☐ subtracts 1000 VPD from Reserve - Broadway to I-90
☐ subtracts 1500-2000 VPD from W. Broadway - Reserve to Grant Creek
☐ subtracts 500-1000 VPD Mullan - west of Reserve
☐ adds 600 VPD to Maclay Bridge

The addition of a west bypass is not considered desirable or beneficial to the road network.

3. South Avenue (Russell to Reserve) - widen to 3-lanes

☐ adds 1800-3300 VPD to South - Reserve to Russell
☐ adds 800 VPD to South - east of Russell
☐ no change on Brooks
☐ subtracts 600-900 VPD from S.3rd - Reserve to Russell

This network modification is considered desirable and would improve the operation of other arterials.

Test Run # 3

Description: This test run included the following road changes:

- Russell Street (Mount to Broadway) - Widen to 4-lanes
- Realign 5th/6th couplet at Arthur
- Orange Street RR Underpass - Widen to 4-lanes
- New Linda Vista Bridge - North/South alignment

Results: The impacts of the road changes tested in this test run are summarized below.

1. Russell Street (Mount to Broadway) - Widen to 4-lanes

- ☐ adds 2000-3400 VPD to Russell - Brooks to Mount
- ☐ adds 4000-5000 VPD to Russell - Mount to S. 3rd
- ☐ adds 4000-5000 VPD to Russell - S. 3rd to Broadway
- ☐ adds 4200 VPD to Russell St. Bridge
- ☐ subtracts 800-1900 VPD from Reserve - north of S. 3rd
- ☐ subtracts 2400 VPD from Catlin
- ☐ subtracts 500-1000 VPD from Reserve - S. 3rd to Brooks

This network modification is considered desirable and would help the operation of other arterials.

2. Realign 5th/6th couplet at Arthur

- ☐ adds 2900 VPD to Madison St. Bridge
- ☐ adds 1700 VPD to Arthur - south of 5th
- ☐ no change 5th
- ☐ adds 1000 VPD to 6th

This network modification will help streamline these arterials and is considered desirable.

3. Orange Street Underpass - Widen to 4-lanes

- ☐ adds 1000 VPD to Orange - Broadway to I-90
- ☐ no change to Orange St. Bridge

This system modification would improve the operation of Orange Street.

4. New Linda Vista Bridge -N/S alignment

- ☐ 6200 VPD use new bridge
- ☐ subtracts 5400 VPD from Lower Miller Creek - Linda Vista to "Y"
- ☐ subtracts 4500-5000 VPD from Lower Miller Creek - "Y" to 93
- ☐ adds 5000 VPD to US 93 - Linda Vista to Miller Creek

This bridge addition is considered to be a good addition to the system. This bridge location appears to draw more traffic off of Lower Miller Creek Road than the other bridge location considered in Test Run #1.

Test Run #4

Description: This test run included the following road changes:

- Russell Street I-90 Interchange
- Johnson Street extension (South to Brooks)
- Stephens Street extension (South to S.W. Higgins)

Results: The impacts of the road changes tested in this test run are summarized below.

1. Russell St. I-90 Interchange

☐ 12,000 VPD use new Russell - Shakespeare to I-90
☐ 11,200 VPD use new Russell - Shakespeare to Rodgers
☐ adds 13500 VPD use new Russell - St. railroad overpass
☐ adds 8000-9000 VPD to Russell - Broadway to railroad crossing
☐ adds 1200 VPD to Russell St. Bridge
☐ adds 3300 VPD to I-90 - west of Reserve
☐ adds 4000 VPD to I-90 - Russell to Reserve
☐ adds 2000 VPD to I-90 - Russell to Orange
☐ subtracts 4000- 6000 VPD from W. Broadway - Russell to Reserve
☐ adds 3000 VPD to Railroad - W. Broadway to Russell
☐ subtracts 3000 VPD from N. Reserve - American Way to W. Broadway
☐ subtracts 3000-4000 VPD from N. Reserve - W. Broadway to I-90
☐ subtracts 2400 VPD from Orange - underpass to I-90

Although this addition to the network provides a direct access to I-90, there are significant concerns about the impacts on the West Side neighborhood which render it undesirable.

2. Johnson St. Extension (South to Brooks)

☐ 7800 VPD use new Johnson - South to Mall
☐ 1800 VPD use new Johnson - Mall to Brooks
☐ subtracts 1500 VPD from Reserve - Brooks to South
☐ subtracts 500 VPD from South - west of Johnson
☐ adds 1000-2000 VPD to Brooks - near mall
☐ adds 200 VPD to South - east of Johnson
☐ adds 700-900 VPD to Johnson - North of South

This network modification is considered desirable and would help the operation of other arterials.

3. Stephens St. Extension (South to S.W. Higgins)

☐ 200-4700 VPD use new Stephens - SW Higgins to South
☐ subtracts 1300 - 4000 VPD from Bancroft - SW Higgins to South
☐ subtracts 1000 VPD from Russell - 39th to South

This modification does not make any significant difference on the adjacent arterial routes and would possibly cause neighborhood impacts.

Test Run #5

Description: The test run included the following road changes:

- Modifications to the South/Brooks/Russell intersection
- S. 3rd. Street (Russell to Reserve) - Widen to 3-lanes
- Mary Street (Reserve to the Mall) - Upgrade and provide RR crossing
- New 2-lane Maclay Bridge
- New Mullan/Airport Street Grid

Results: The impacts of the road changes tested in this test run are summarized below.

1. Modification to SBR Intersection

- ☐ no real change on the corridor volumes
- ☐ 5500 VPD use new SW link
- ☐ 3100 VPD use new NE link
- ☐ No change on Russell
- ☐ adds 3000 VPD to Brooks - both approaches
- ☐ No problems identified

This modification would help relieve congestion at this intersection and improve the overall operation of the arterials in this area.

2. S. 3rd (Russell to Reserve) - Widen to 3-lanes

- ☐ adds 1400-2000 VPD to S. 3rd - Russell to Reserve

This network modification is considered desirable and would help the operation of other arterials.

3. Mary Street (Reserve to Mall) - Upgrade and provide RR crossing

- ☐ adds 4300 VPD to Mary
- ☐ 5200 VPD go into Mall
- ☐ subtracts 2600 VPD from South - Reserve to Mall
- ☐ subtracts 1300 VPD from Brooks - Reserve to Mall
- ☐ adds 2600 VPD to Reserve - South to Mary
- ☐ no change on Reserve - south of Mary

This modification would provide direct access to the mall from Reserve Street which reduces traffic on several arterial links. Although there are some concerns about impacts on the adjacent neighborhoods, this modification is considered desirable.

4. New 2-lane Maclay Bridge

- ☐ adds 100 VPD to bridge

This network does not significantly change traffic patterns or benefit the arterial network.

5. New Mullan/Airport Street Grid

☐ 4400 VPD use east/west link - Flynn and Reserve
☐ 3000 VPD use east/west link - west of Flynn
☐ 1500-2000 VPD use north/south link
☐ reduces 2500 VPD from Mullan - Flynn to Reserve
☐ reduces 1500 VPD from W. Broadway - Flynn to Reserve
☐ reduces 800 VPD from Mullan - west of Flynn

The addition of a structured road network in this area is considered very desirable. This area has been identified as a likely location for development during the next twenty years. A pre-planned, logical road network for this area will prevent undesirable impacts in the future.

Test Run #6

Description: This alternative growth test run was developed based on input from the Growth Management Committee and local planners. This alternative promotes growth management goals and included the following road changes:

- Increased residential and commercial infilling within the City Limits
- Increased residential densities in the area west of Reserve between Mullan and Broadway, Target Range, and in the area between Reserve and Russell between the river and the Bitterroot Spur.
- Increased industrial development between I-90 and Broadway (from Scott Street to the Airport)
- Significant pedestrian and bicycle facility improvements

Results: The impacts of the road changes tested in this test run are summarized below.

☐ Reduces total VMT by 130,000 miles per day (6.5%)
☐ reduces total number of vehicle bridge crossings be 12,000 VPD
☐ subtracts 5,000 VPD from Reserve Street Corridor (Mullan to Brooks)
☐ subtracts 9,000 VPD from Brooks (Lower Miller Creek to Reserve)
☐ subtracts 5,000 - 6,000 VPD from Brooks (Reserve to Stephens)
☐ subtracts 2,000- 3,000 VPD on 39th Street
☐ subtracts 2,000 - 3,000 VPD from Higgins Ave. Corridor (south of Clark Fork)
☐ subtracts 4,000 VPD from South Avenue (Reserve to Russell)
☐ adds 3,000 VPD to Mullan west of Reserve
☐ adds 2,000 VPD to Broadway (Reserve to Russell)
☐ subtracts 2,000 VPD from Broadway (Russell to Scott)

The results of this test run indicate that the growth management strategies will improve the operation of many sections of the arterial network, and is therefore considered desirable.

Chapter 9: Roadway System Needs Assessment

9.0 Roadway System Needs Assessment

9.1 Arterial Corridor Analysis

This section focuses on an overall analysis of 13 arterial corridors within the Missoula urban area. A map of these major travel corridors is shown in **FIGURE 9-1**. Relevant data about each corridor was obtained through a combination of field data collection and review of existing documents. Corridor information presented in this section includes: corridor length, functional classification, traffic volumes, number of lanes and roadway section, posted speed limit, signalized intersection levels of service, high accident locations, bridges and other structures, pedestrian and bicycle facilities, on-street parking, corridor lighting, transit service, truck routes, and adjacent land use.

One of the most important gauges of the adequacy of an arterial route is a comparison of the anticipated traffic demand to the number of travel lanes provided. A rule of thumb of 12,000 vehicles per day maximum for two-lane roads and 30,000 vehicles per day for four-lane roads was used to evaluate each facility. **FIGURE 9-2** shows the sections of the road network that will require capacity-related modifications to meet the anticipated traffic demand in the year 2015.

For a more detailed description of the signal analysis conducted for the entire Missoula signal system, see Section 2.3 of this document. In addition, a complete analysis of Missoula's existing signal system was recently completed. For additional information, refer to the *Traffic Signal Operation Improvement Study*, prepared by Barton-Aschman Associates, Inc.

Key features and deficiencies along each corridor are discussed on the following pages, along with a summary of the recommended improvements contained in Chapter 12 of this document.

9.1.1 Reserve Street Corridor (I-90 to 39th Street)

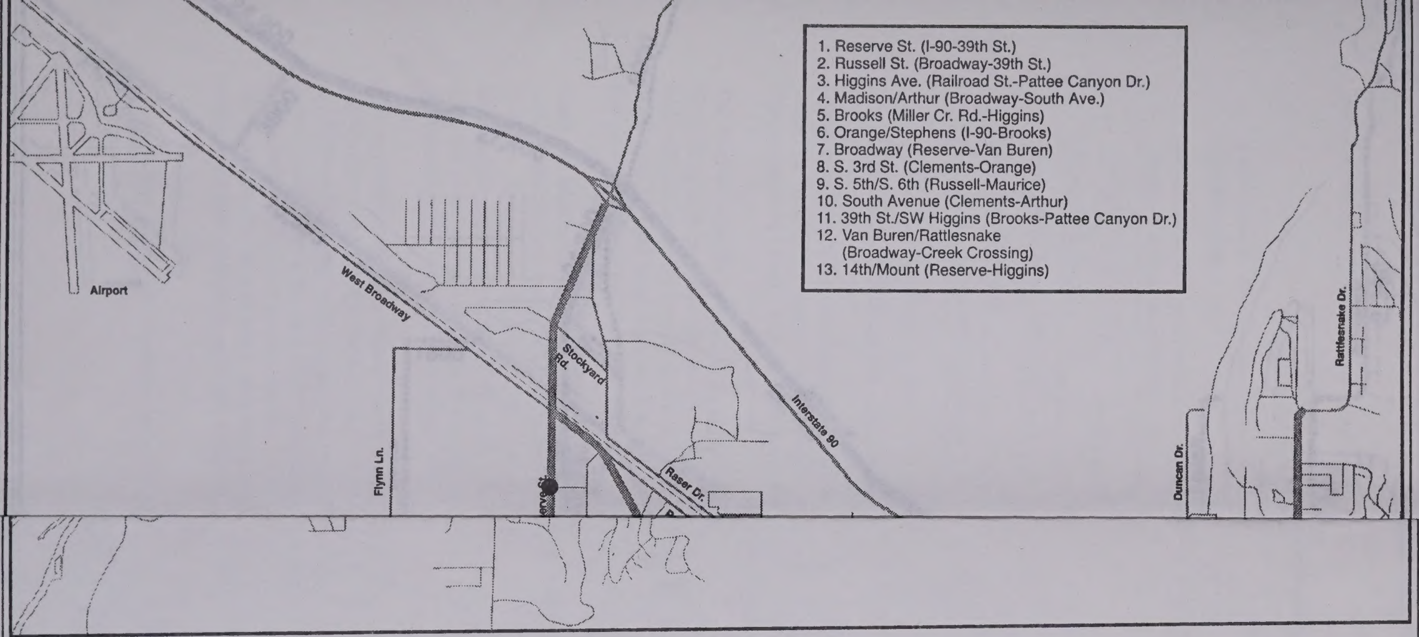
This corridor encompasses the entire length of Reserve Street within the Missoula urban area. This corridor is signed as U.S. Highway 93 between I-90 and Brooks, and includes a portion of P-71 (I-90 to Broadway) and all of U-8103 (Broadway to 39th). The southern portion of the corridor is a newly widened five-lane urban section with 15-foot-wide outside lanes allowing bicycle travel adjacent to vehicle traffic, curb and gutter, and sidewalks or pedestrian paths on both sides. North of South 3rd Street West, the roadway narrows to two lanes, with no bicycle facilities. There is curb and gutter and sidewalk on the east side of Reserve between South 3rd Street West and Mullan Road. Key features of this corridor are outlined in **TABLE 9-1**.

TABLE 9-1
Reserve Street Corridor Summary

Feature	
Length	5.54 miles
Functional Classification (Brooks-39th)	Principal Arterial (Minor Arterial)
1994 Traffic Volume	14,400-25,300
2015 Traffic Volume	24,800-39,800
Number of Lanes	2-5
Posted Speed Limit	35-45
Signalized Intersections	8
High Accident Locations*	7
Bridges/Tunnels	2
Bicycle Facilities	S. 3rd - Brooks
Pedestrian Facilities	Mullan - 39th
On-Street Parking	No
Corridor Lighting	S 7th W - Mount
Transit Service	Old US 93 - 39th
Truck Route	Yes
Adjacent Land Use	Commercial
Recommended Improvements	Yes

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, signals are located at the intersections of Reserve Street with Northern Pacific Street, Union Pacific Street, Mullan Road, South 3rd Street West, Mount Avenue, Porter Middle School (north of Central Avenue), South Avenue, and Brooks Street. The current and projected levels of service for each of these signalized intersections are shown in **TABLE 9-2**. The intersection of Reserve with Brooks has the highest volumes in the entire Missoula urban area, and will be a location of serious long-term capacity problems. The signalized intersections along the corridor have pedestrian crossing facilities, and are handicapped accessible (curb ramps at all crossings) except for the Reserve/Mullan intersection.


1. Reserve St. (I-90-39th St.)
2. Russell St. (Broadway-39th St.)
3. Higgins Ave. (Railroad St.-Pattee Canyon Dr.)
4. Madison/Arthur (Broadway-South Ave.)
5. Brooks (Miller Cr. Rd.-Higgins)
6. Orange/Stephens (I-90-Brooks)
7. Broadway (Reserve-Van Buren)
8. S. 3rd St. (Clements-Orange)
9. S. 5th/S. 6th (Russell-Maurice)
10. South Avenue (Clements-Arthur)
11. 39th St./SW Higgins (Brooks-Pattee Canyon Dr.)
12. Van Buren/Rattlesnake (Broadway-Creek Crossing)
13. 14th/Mount (Reserve-Higgins)
Airport
West Broadway
Stockyard Rd.
Flynn Ln.
Reserve St.
Raser Dr.
Interstate 90
Duncan Dr.
Rattlesnake Dr.

Arterials Included in Corridor Analysis

LEGEND

● Existing Signalized Intersections

▨ Major Travel Corridors

Map - Not To Scale

MISSOULA
URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996

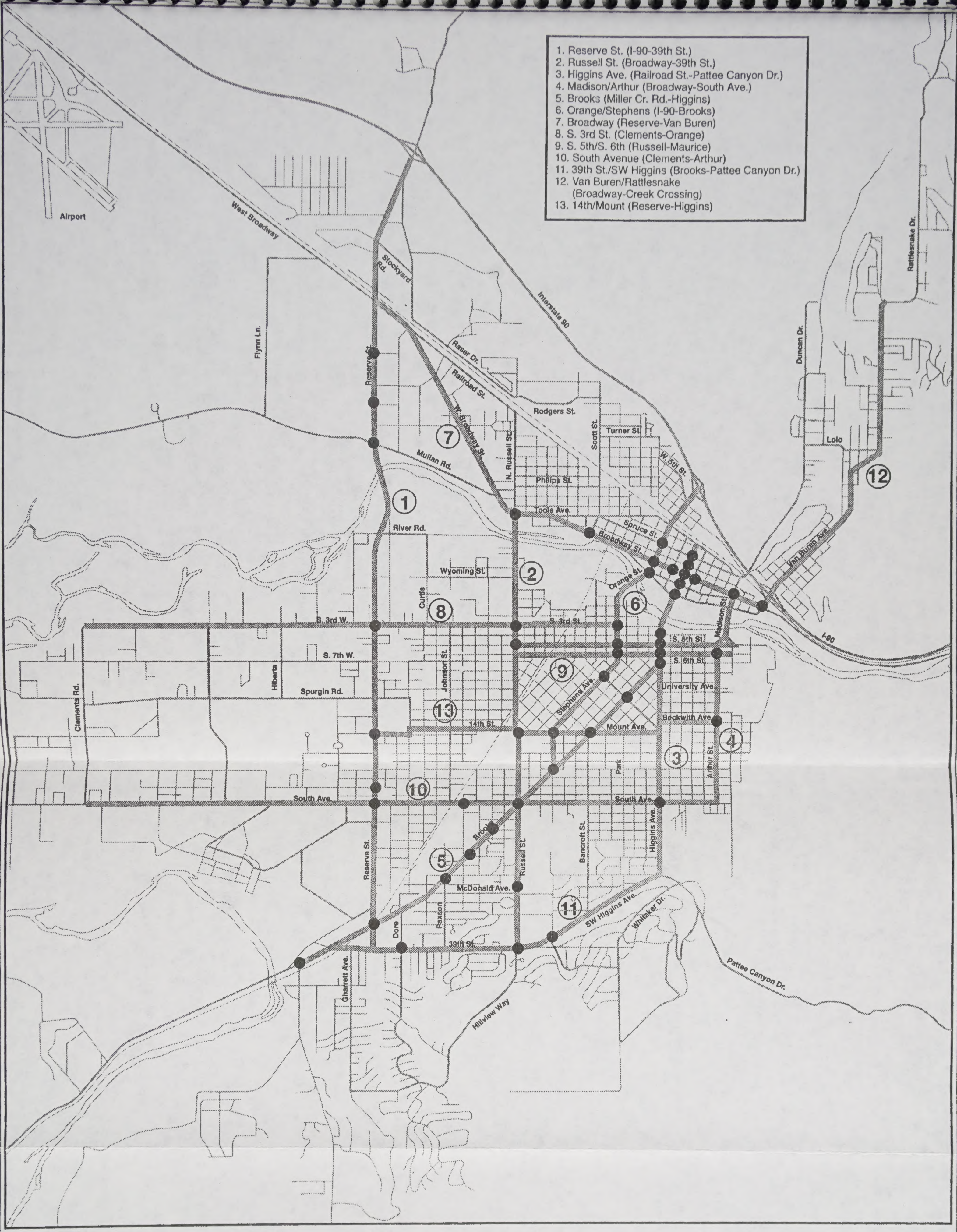
Figure 9-1
Arterials Included In
Corridor Analysis

TABLE 9-1
Reserve Street Corridor Summary

Feature	
Length	5.54 miles
Functional Classification (Brooks-39th)	Principal Arterial (Minor Arterial)
1994 Traffic Volume	14,400-25,300
2015 Traffic Volume	24,800-39,800
Number of Lanes	2-5
Posted Speed Limit	35-45
Signalized Intersections	8
High Accident Locations*	7
Bridges/Tunnels	2
Bicycle Facilities	S. 3rd - Brooks
Pedestrian Facilities	Mullan - 39th
On-Street Parking	No
Corridor Lighting	S 7th W - Mount
Transit Service	Old US 93 - 39th
Truck Route	Yes
Adjacent Land Use	Commercial
Recommended Improvements	Yes

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, signals are located at the intersections of Reserve Street with Northern Pacific Street, Union Pacific Street, Mullan Road, South 3rd Street West, Mount Avenue, Porter Middle School (north of Central Avenue), South Avenue, and Brooks Street. The current and projected levels of service for each of these signalized intersections are shown in **TABLE 9-2**. The intersection of Reserve with Brooks has the highest volumes in the entire Missoula urban area, and will be a location of serious long-term capacity problems. The signalized intersections along the corridor have pedestrian crossing facilities, and are handicapped accessible (curb ramps at all crossings) except for the Reserve/Mullan intersection.



1. Reserve St. (I-90-39th St.)
2. Russell St. (Broadway-39th St.)
3. Higgins Ave. (Railroad St.-Pattee Canyon Dr.)
4. Madison/Arthur (Broadway-South Ave.)
5. Brooks (Miller Cr. Rd.-Higgins)
6. Orange/Stephens (I-90-Brooks)
7. Broadway (Reserve-Van Buren)
8. S. 3rd St. (Clements-Orange)
9. S. 5th/S. 6th (Russell-Maurice)
10. South Avenue (Clements-Arthur)
11. 39th St./SW Higgins (Brooks-Pattee Canyon Dr.)
12. Van Buren/Rattlesnake (Broadway-Creek Crossing)
13. 14th/Mount (Reserve-Higgins)

Figure 9-1
Arterials Included In
Corridor Analysis

Arterials Included in Corridor Analysis

LEGEND

● Existing Signalized Intersections

▬ Major Travel Corridors

Map - Not To Scale

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URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996

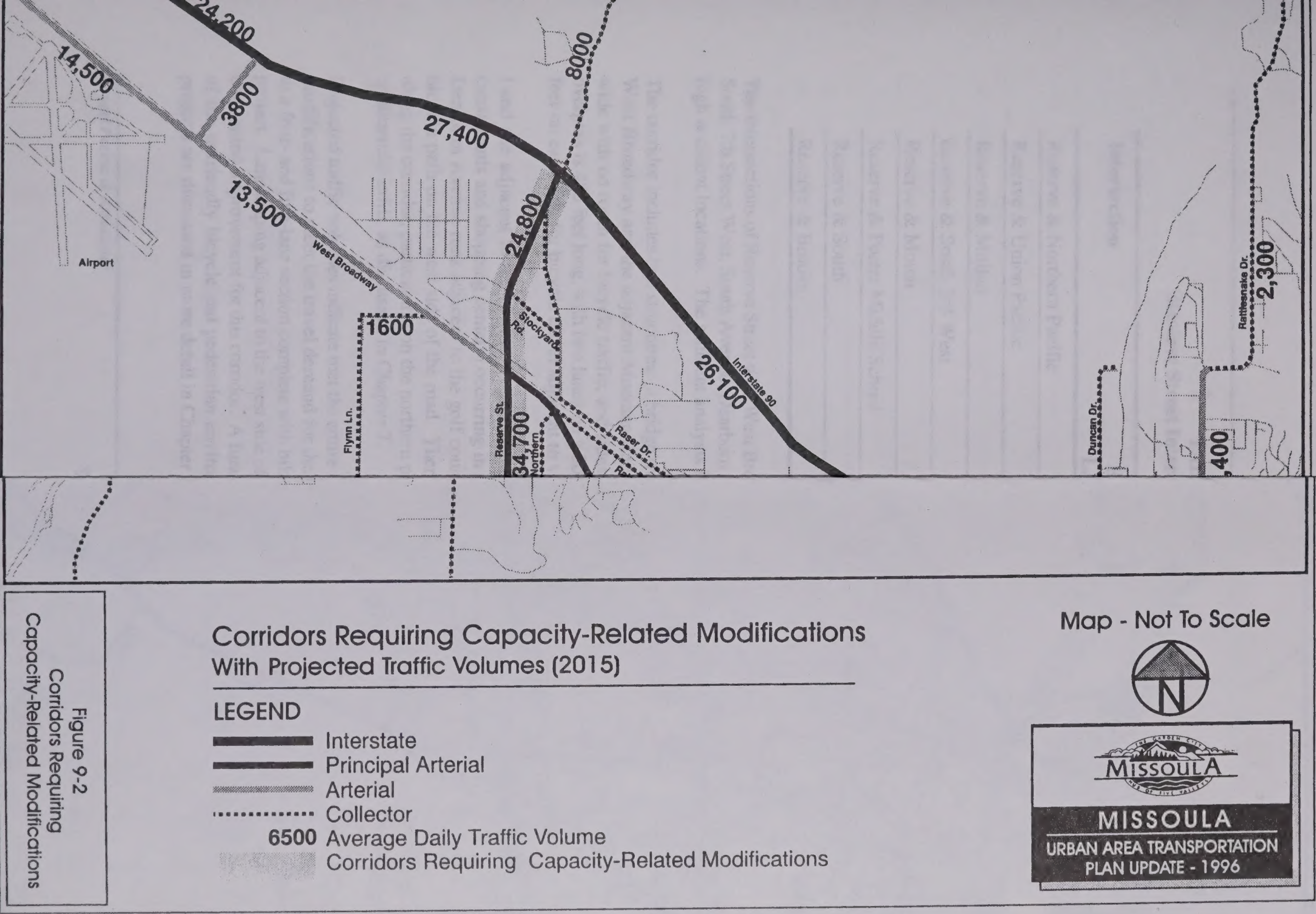
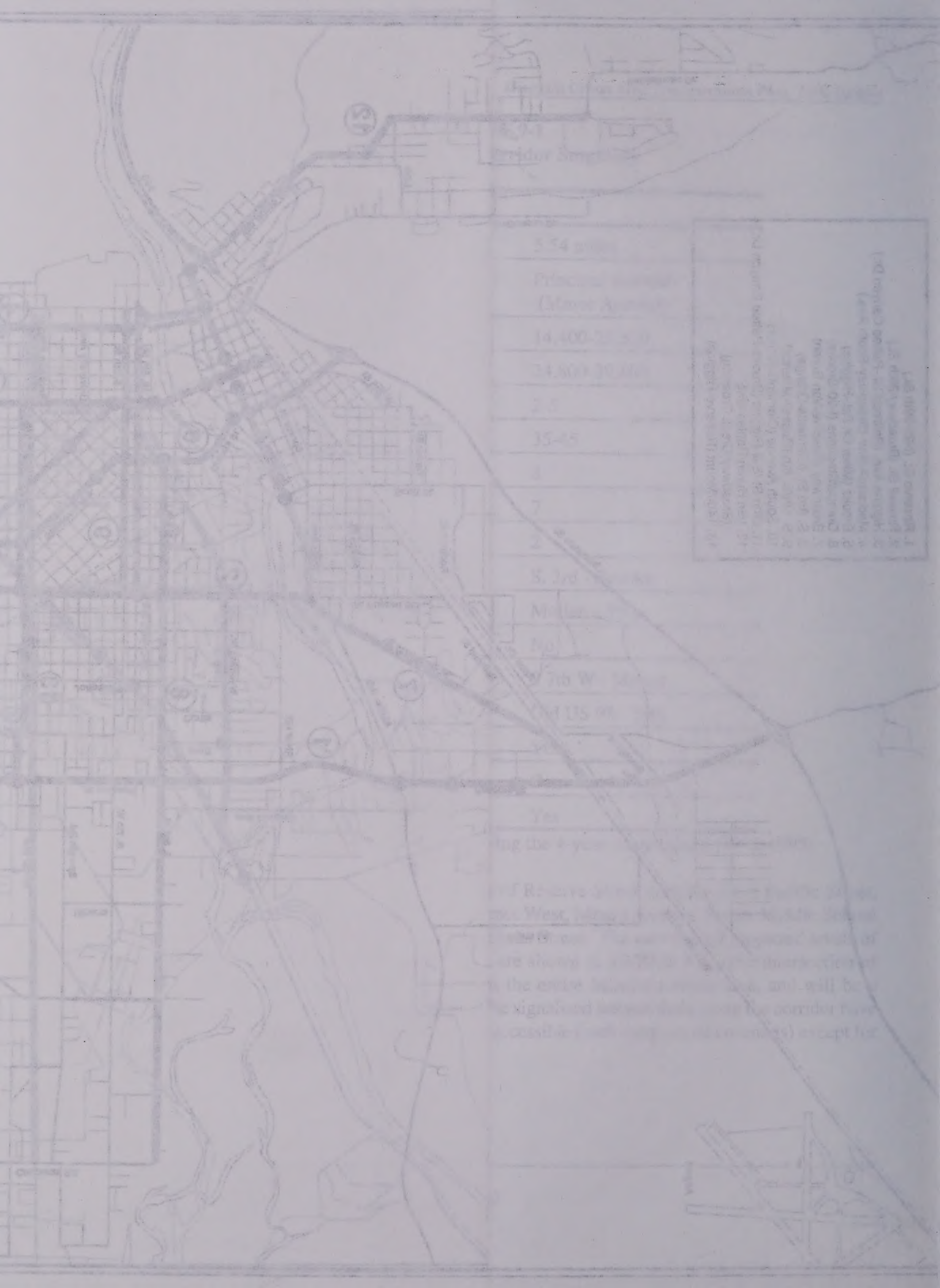


Figure 9-2
Corridors Requiring
Capacity-Related Modifications



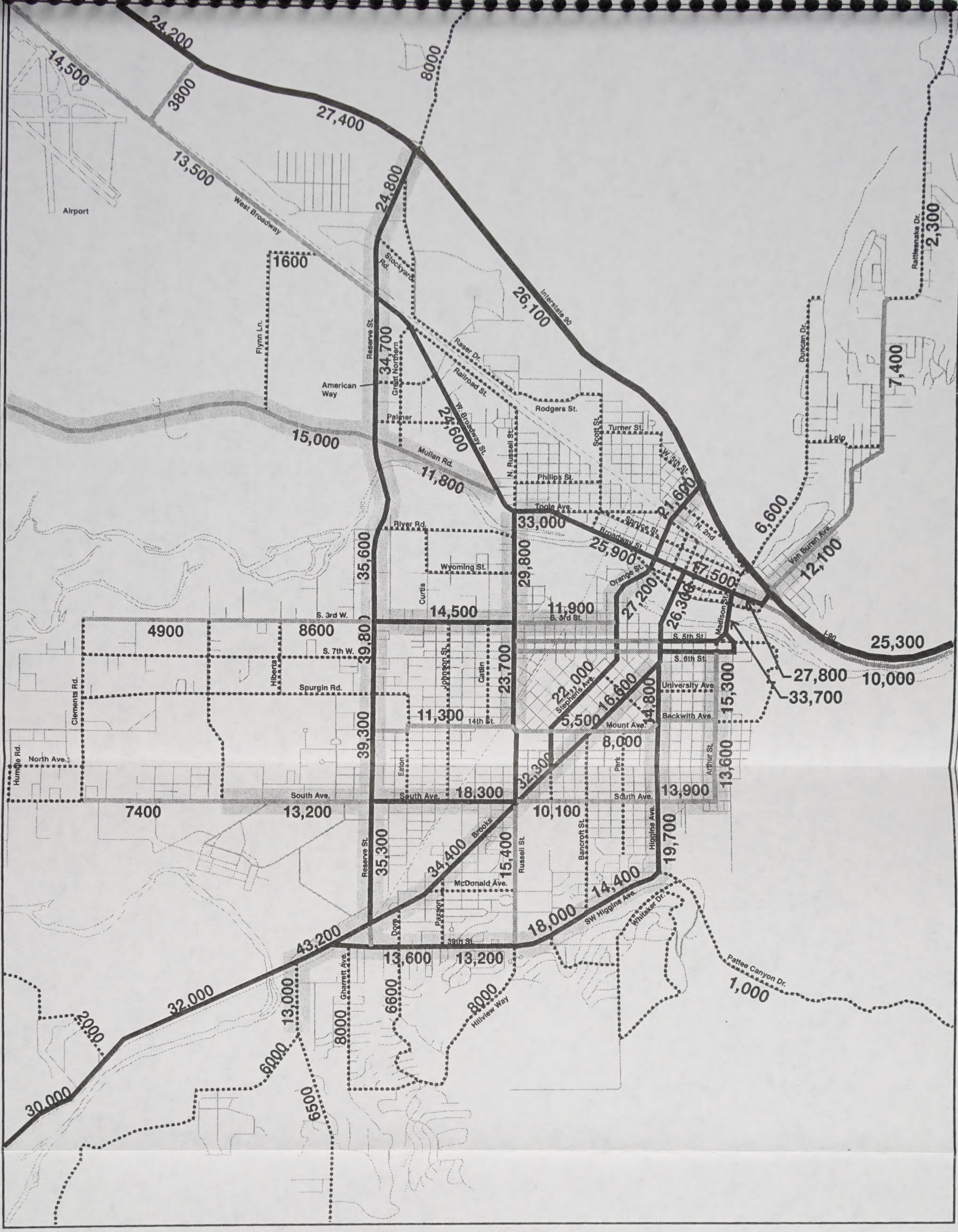


Figure 9-2
Corridors Requiring
Capacity-Related Modifications

Corridors Requiring Capacity-Related Modifications
With Projected Traffic Volumes (2015)

LEGEND

━━ Interstate
━━ Principal Arterial
━━ Arterial
········ Collector
6500 Average Daily Traffic Volume
▨ Corridors Requiring Capacity-Related Modifications

Map - Not To Scale

N

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URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996

TABLE 9-2
Reserve Street Intersection Level of Service

Intersection	Existing (1994) L.O.S. (AM/PM)	Projected (2015) L.O.S. (AM/PM)
Reserve & Northern Pacific	A/B	B/F
Reserve & Union Pacific	A/B	C/F
Reserve & Mullan	C/D	F/F
Reserve & South 3rd West	C/C	C/F
Reserve & Mount	B/B	D/F
Reserve & Porter Middle School	A/A	A/A
Reserve & South	B/C	C/D
Reserve & Brooks	C/D	C/F

The intersections of Reserve Street with West Broadway Street, Mullan Road, South 3rd Street West, South 7th Street West, South Avenue, Dearborn Avenue, and Brooks Street have been identified as high accident locations. The accident analysis is presented in Section 2.4 of this document.

The corridor includes two structures: a bridge over the Clark Fork River, and an overpass spanning West Broadway and the adjacent Montana Rail Link tracks. The Clark Fork bridge is three lanes wide with no room for bicycle traffic, and sidewalk on the east side only. The Broadway/railroad overpass is 485 feet long, with two lanes on a 30-foot paved surface, allowing approximately three feet on each side for bicycle travel adjacent to vehicle lanes, and no sidewalks.

Land use adjacent to the corridor is predominantly commercial, with a lot of new development (restaurants and shopping centers) occurring in recent years. The section between Old US 93 and Dearborn Avenue runs adjacent to the golf course, with a boulevard-separated asphalt pedestrian/ bicycle path on the west side of the road. There is still a significant amount of developable land along the corridor, particularly on the northern portion. The entire corridor has been identified for commercial infill, as discussed in Chapter 7.

Projected traffic volumes indicate that the entire length of the corridor will require capacity-related modifications to meet the travel demand for the year 2015. Widening Reserve north of South 3rd to a four- and five-lane section complete with bike lanes and sidewalks is a committed improvement project. Landscaping adjacent to the west side of the roadway between South and Brooks is another committed improvement for this corridor. A final major improvement calls for overall enhancement of the unfriendly bicycle and pedestrian environment between South 3rd and 39th. These three projects are discussed in more detail in Chapter 12.

9.1.2 Russell Street Corridor (Broadway to 39th Street)

This corridor encompasses the portion of Russell Street between West Broadway Street and 39th Street within the Missoula urban area. The corridor includes all of U-8105. Russell Street has a two-lane urban section with curb and gutter, except between River Road and South 3rd Street West. Russell has 15-foot-wide outside lanes between River and South 3rd, and between Fairview and 39th; and 14-foot-wide outside lanes between South 3rd and South 7th, and between the Bitterroot Branch railroad and Brooks, allowing bicycle travel alongside vehicle traffic. The corridor has sidewalks on one or both sides between Broadway and River, between South 3rd and South 7th, between South 12th and Brooks, and between Fairview and 39th. Key features of this corridor are outlined in **TABLE 9-3**.

TABLE 9-3
Russell Street Corridor Summary

Feature	
Length	3.01 miles
Functional Classification (Brooks-39th)	Principal Arterial (Minor Arterial)
1994 Traffic Volume	12,300-22,300
2015 Traffic Volume	15,400-29,800
Number of Lanes	2-4
Posted Speed Limit	25-35
Signalized Intersections	7
High Accident Locations*	7
Bridges/Tunnels	1
Bicycle Facilities	River - S. 7th Bitterroot Branch RR - Brooks Fairview - 39th (See text above)
Pedestrian Facilities	Broadway - River S. 3rd - S. 7th S. 12th - Brooks Fairview - 39th
On-Street Parking	Mixed
Corridor Lighting	Bridge, S 5th - Brooks

Feature	
Transit Service	Broadway - S 3rd S 5th - S 6th Benton - McDonald
Truck Route	Yes
Adjacent Land Use	Residential
Recommended Improvements	Yes

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, signals are located at the intersections of Russell Street with West Broadway Street, South 3rd Street, South 5th Street, Mount Avenue/14th Street, Brooks Street/South Avenue, Russell Elementary School (north of McDonald Avenue), and 39th Street. The current and projected levels of service for each of these signalized intersections are shown in **TABLE 9-4**. The six-way intersection of Russell with Brooks and South is widely known as "malfunction junction", and has chronic problems with congestion due to the combined traffic volumes intersecting on these three major arterials. The signalized intersections along the corridor have pedestrian crossing facilities, and are handicapped accessible (curb ramps at all crossings).

TABLE 9-4
Russell Street Intersection Level of Service

Intersection	**Existing (1994) L.O.S. (AM/PM)**	**Projected (2015) L.O.S. (AM/PM)**
Russell & Broadway	C/D	D/F
Russell & S. 3rd W.	D/D	D/E
Russell & S. 5th	B/B	B/B
Russell & Mount/14th	B/C	C/D
Russell & Brooks/South	D/F	F/F
Russell & Russell School	A/A	A/A
Russell & 39th	B/B	B/D

The intersections of Russell Street with South 2nd Street West, South 3rd Street West, South 4th Street West, South 5th Street West, North Avenue, Kent Avenue, and 39th Street/Hillview Way have been identified as high accident locations. The accident analysis is presented in Section 2.4.

The corridor includes one structure, a bridge over the Clark Fork River. The Clark Fork bridge is 420 feet long, with two lanes on a 24-foot-wide traffic surface, allowing no room for bicycle travel adjacent to vehicle lanes, and four-foot-wide sidewalks on both sides.

Land use adjacent to the corridor is predominantly residential, with scattered businesses, and portions running adjacent to McLeod Park and the County Fairgrounds. The area west of Russell between the railroad tracks and the river has been identified for residential infill, as discussed in Chapter 7.

Projected traffic volumes indicate that the portion of the corridor between Broadway and Mount/14th will require capacity-related modifications to meet the travel demand for the year 2015. Widening Russell between Broadway and South 3rd to a five-lane section, including bicycle/pedestrian facilities and reconstruction of the bridge, is a recommended major improvement. Another major improvement recommended for the corridor is the widening of Russell between South 5th and Mount/14th to a five-lane section, complete with bike lanes and sidewalks. The Brooks/South/Russell intersection is recommended for realignment as a CMAQ improvement project. All three of these projects are discussed further in Chapter 12. A general concern about this corridor is that Russell Street provides one of only two bridge crossings in Missoula that does not connect to I-90. The extension of North Russell Street and construction of an interchange at Coal Mine Road to provide interstate access to this corridor are related major recommended improvements.

9.1.3 Higgins Avenue Corridor (Railroad Street to Pattee Canyon Drive)

This corridor encompasses the entire length of Higgins Avenue within the Missoula urban area. The corridor is signed as U.S. Highway 12 between South 5th Street and Brooks, and includes portions of P-7 and U-8117, and all of U-8119 and U-8113. The northern portion of this corridor has a four-lane urban section with on-street parking, curb and gutter, and sidewalks on both sides. The segment between Brooks and South Avenue has two lanes, 15-foot-wide outside lanes allowing bike travel adjacent to vehicle traffic, curb and gutter, and sidewalks on both sides. The portion south of South Avenue is a two-lane section with 15-foot-wide outside lanes, and curb and sidewalk on the west side only. Key features of this corridor are outlined in **TABLE 9-5**.

TABLE 9-5
Higgins Avenue Corridor Summary

Feature	
Length	2.40 miles
Functional Classification (Railroad-Broadway)	Principal Arterial (Collector)
1994 Traffic Volume	10,600-19,100
2015 Traffic Volume	14,800-26,300
Number of Lanes	2-4
Posted Speed Limit	25-30
Signalized Intersections	10

Feature	
High Accident Locations*	4
Bridges/Tunnels	1
Bicycle Facilities	Brooks - Pattee Canyon Drive
Pedestrian Facilities	Yes
On-Street Parking	Railroad - Brooks
Corridor Lighting	Railroad - S 6th Strand/Beverly - Pattee Canyon Drive
Transit Service	Spruce - Pattee Canyon Drive
Truck Route	S 3rd - Pattee
Adjacent Land Use	Commercial
Recommended Improvements	Yes

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, signals are located at the intersections of Higgins Avenue with Spruce Street, Pine Street, Broadway Street, Main Street, Front Street, South 4th Street, South 5th Street, South 6th Street, Brooks Street, and South Avenue. The current and projected levels of service for each of these signalized intersections are shown in **TABLE 9-6**. The following intersections have been identified for possible future new signals: Higgins with Mount Avenue/Hill Street and East Beckwith Avenue, and Higgins with Pattee Canyon Drive (see projects #17 and #18 on page 12-6). The signalized intersections along the corridor have pedestrian crossing facilities, and are handicapped accessible (curb ramps at all crossings).

TABLE 9-6
Higgins Avenue Intersection Level of Service

Intersection	Existing (1994) L.O.S. (AM/PM)	Projected (2015) L.O.S. (AM/PM)
Higgins & Spruce	B/B	B/B
Higgins & Pine	B/B	B/B
Higgins & Broadway	B/B	B/C
Higgins & Main	B/B	B/B
Higgins & Front	B/B	B/C
Higgins & S. 4th	A/B	A/B

Intersection	**Existing (1994) L.O.S. (AM/PM)**	**Projected (2015) L.O.S. (AM/PM)**
Higgins & S. 5th	B/B	B/D
Higgins & S. 6th	B/B	B/C
Higgins & Brooks	B/C	B/C
Higgins & South	B/C	B/F

The intersections of Higgins Avenue with Broadway Street, South 4th Street, South 5th Street, and South Avenue have been identified as high accident locations. The accident analysis is presented in Section 2.4 of this document.

The corridor includes one structure, a bridge over the Clark Fork River. The Clark Fork bridge is 972 feet long, with four lanes on a 52-foot-wide traffic surface plus raised center median, allowing minimal room for bicycle travel adjacent to vehicle lanes, and five-foot-wide sidewalks on both sides.

Land use adjacent to the corridor is predominantly commercial, with scattered residences, and portions running adjacent to Hellgate High School, Paxson Elementary School, Campbell Park and the University Golf Course.

Projected traffic volumes indicate that the portion of the corridor between Brooks and Pattee Canyon Drive will require capacity-related modifications to meet the travel demand for the year 2015. Widening Higgins between South and Pattee Canyon Drive to a three-lane urban section, complete with curb and gutter, bike lanes and sidewalks, is a recommended major improvement. This project includes the realignment of Pattee Canyon Road to intersect Higgins one block further north. Another major improvement recommended for the corridor is the removal of parking and restriping of Higgins between Brooks and South to accommodate three travel lanes and bike lanes within existing curb lines. This project includes the redesign of the intersection of Higgins with Mount/Hill and Beckwith. The final recommendation is a TSM project restricting parking along Higgins between South 4th and Brooks as alternate parking becomes available. Parking restrictions during peak hours will reduce congestion and provide room for bicycle traffic. The three recommended projects for the Higgins Avenue corridor are discussed in detail in Chapter 12.

9.1.4 Madison Street/Arthur Avenue Corridor (Broadway to South Avenue)

This corridor encompasses the portion of Madison Street between West Broadway Street and South 6th Street, and the entire length of Arthur Avenue (South 6th Street to South Avenue) within the Missoula urban area. The corridor is signed as U.S. Highway 12 between South 6th and Broadway, and includes a portion of P-7 and all of U-8121. Madison Street has a four-lane urban section with 14-foot-wide outside lanes allowing bike travel adjacent to vehicle traffic, curb and gutter, and sidewalks on both sides. Arthur Avenue north of Beckwith has a two-lane urban section with 15-

foot-wide outside lanes, curb and gutter, and sidewalks on both sides. Arthur Avenue south of Beckwith has a two-lane urban section with on-street parking, curb and gutter, and sidewalks on both sides. Key features of this corridor are outlined in **TABLE 9-7**.

TABLE 9-7
Madison Street/Arthur Avenue Corridor Summary

Feature	
Length	1.48 miles
Functional Classification	
Madison (Broadway - S 5th)	Principal Arterial
Arthur (S 5th - S 6th)	Collector
Arthur (S 6th - South)	Minor Arterial
1994 Traffic Volume	10,900-27,500
2015 Traffic Volume	13,600-33,700
Number of Lanes	2-4
Posted Speed Limit	25-30
Signalized Intersections	3
High Accident Locations*	1
Bridges/Tunnels	1
Bicycle Facilities	Broadway - Beckwith
Pedestrian Facilities	Yes
On-Street Parking	Beckwith - South
Corridor Lighting	Yes
Transit Service	Yes
Truck Route	Madison
Adjacent Land Use	Residential/University
Recommended Improvements	Yes

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, signals are located at the intersections of Madison Street with Broadway Street, and Arthur Avenue with South 6th Street and Beckwith Avenue. The current and projected levels of service for each of these signalized intersections are shown in **TABLE 9-8**. The intersection of Madison with Broadway has heavy volumes and strong turning movements which will need to continue to be accommodated over the long term. The signalized intersections along the corridor have pedestrian crossing facilities, and are only partially handicapped accessible (curb ramps at all crossings only at Arthur/Beckwith).

TABLE 9-8
Madison Street/Arthur Avenue Intersection Level of Service

Intersection	Existing (1994) L.O.S. (AM/PM)	Projected (2015) L.O.S. (AM/PM)
Madison & Broadway	B/C	C/C
Arthur & South 6th West	B/B	B/B
Arthur & Beckwith	B/C	C/C

The intersection of Arthur Avenue with South 6th Street has been identified as a high accident location. The accident analysis is presented in Section 2.4.

The corridor includes one structure, a bridge over the Clark Fork River. The Madison Street bridge is 552 feet long, with four lanes on a 46-foot-wide traffic surface, plus raised center median, allowing minimal room for bicycle travel adjacent to vehicle lanes, and four-foot-wide sidewalks on both sides.

Land use adjacent to the corridor is predominantly residential, with scattered businesses, and portions running adjacent to Rankin Park and the University of Montana campus.

Projected traffic volumes indicate that the portion of the corridor between South 6th and South will require capacity-related modifications to meet the travel demand for the year 2015. Reconstructing the south approach to the Madison bridge, and widening Arthur between South 5th and South 6th to a four-lane section, including bicycle/pedestrian facilities and reconstruction of a portion of the bridge, is a recommended major improvement. Construction of a bicycle/pedestrian trail along the west side of the south bridge approach is a TSM improvement. Both of these projects are discussed further in Chapter 12. There is a continuing concern about the conflicting character of Arthur, as it is heavily loaded for a residential street. The best way to deal with this problem is to ensure that adjacent arterials are sized appropriately so that no unnecessary traffic uses Arthur.

9.1.5 Brooks Street Corridor (Miller Creek Road to Higgins Avenue)

This corridor encompasses the entire length of Brooks Street within the Missoula urban area. This corridor is signed as U.S. Highway 93 between Miller Creek and Reserve, and as U.S. Highway 12 throughout, and includes a portion of P-7. Brooks between Miller Creek and Dixon has a five-lane urban section with 15-foot-wide shoulders for bike travel adjacent to vehicle traffic, curb and gutter, and intermittent sidewalk on one side. Brooks between Dixon and Russell/South has a five-lane urban section with no room for bike traffic, curb and gutter, and intermittent sidewalk on one side. Brooks between Russell/South and Mount has a five-lane urban section with curb and gutter, and no bicycle or pedestrian facilities. Between Mount and Higgins, the roadway narrows to two lanes with on-street parking, curb and gutter, and sidewalks on both sides. Key features of this corridor are outlined in **TABLE 9-9**.

TABLE 9-9
Brooks Street Corridor Summary

Feature	
Length	3.42 miles
Functional Classification	Principal Arterial
1994 Traffic Volume	14,900-28,300
2015 Traffic Volume	16,600-43,200
Number of Lanes	2-5
Posted Speed Limit	30-45
Signalized Intersections	10
High Accident Locations*	11
Bridges/Tunnels	0
Bicycle Facilities	Miller Creek - Dixon
Pedestrian Facilities	39th-Russell/South (intermittent) Burlington - Higgins
On-Street Parking	Mount - Higgins
Corridor Lighting	McDonald - Bancroft
Transit Service	Dore - McDonald
Truck Route	Yes
Adjacent Land Use	Commercial
Recommended Improvements	Yes

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, signals are located at the intersections of Brooks Street with Miller Creek Road, Reserve Street, Paxson Street, Southgate Mall (Grant Street), Fairview Avenue, Russell Street/South Avenue, Stephens Avenue, Mount Avenue, West Beckwith Street East, and Higgins Avenue. The current and projected levels of service for each of these signalized intersections are shown in **TABLE 9-10**. The six-way intersection of Brooks with Russell and South is widely known as "malfunction junction", and has chronic problems with congestion due to the combined traffic volumes intersecting on these three major arterials. The signalized intersections along the corridor have pedestrian crossing facilities, and are handicapped accessible (curb ramps at all crossings).

TABLE 9-10
Brooks Street Intersection Level of Service

Intersection	Existing (1994) L.O.S. (AM/PM)	Projected (2015) L.O.S. (AM/PM)
Brooks & Miller Creek	B/B	F/D
Brooks & Reserve	C/D	C/F
Brooks & Paxson	B/B	A/B
Brooks & Southgate Mall	A/B	A/B
Brooks & Fairview	B/B	B/B
Brooks & Russell/South	D/F	F/F
Brooks & Stephens	C/C	C/C
Brooks & Mount	B/C	B/C
Brooks & Beckwith	B/B	B/B
Brooks & Higgins	B/C	B/C

The intersections of Brooks Street with 39th Street, Reserve Street, Dore Lane, Paxson Street, Garfield Street, Catlin Street/Fairview Avenue, Washburn Street/Dearborn Avenue, Central Avenue/Regent Street, Kent Avenue, North Avenue, and Crosby Street have been identified as high accident locations. The accident analysis is presented in Section 2.4.

The corridor does not include any structures.

Land use adjacent to the corridor is commercial with predominantly residential development between Mount and Higgins, and small portions running adjacent to the County Fairgrounds and Sunset Memorial Park.

Projected traffic volumes indicate that the entire length of the corridor will require capacity-related modifications to meet the travel demand for the year 2015. The commercial segment of this corridor is already fully developed within a limited amount of right-of-way, without adequate bicycle or pedestrian facilities. This situation makes road widening an unlikely option. It would be desirable, however, to acquire enough additional right-of-way to provide bike/ped facilities all along this corridor.

The Brooks/South/Russell intersection is recommended for realignment as a CMAQ improvement project. This project is discussed in more detail in Chapter 12. In addition, two major projects were considered and rejected for funding during the 20-year study period. Installation of a roadway lighting system along Brooks between Dixon and Miller Creek was a considered improvement. Widening Brooks between Mount and Higgins to a four-lane section complete with on-street parking, bike lanes and sidewalks was another project that was considered. A major reason for rejection of this project was that this portion of Brooks is lined with mature trees and boulevard sidewalks, and runs through a nice, residential neighborhood. The Brooks/39th intersection should be reconfigured to eliminate left turns.

9.1.6 Orange Street/Stephens Avenue Corridor (I-90 to Brooks)

This corridor encompasses all of Orange Street, and the portion of Stephens Avenue between Orange Street and Brooks within the Missoula urban area. The corridor includes all of U-8107. Orange Street north of Alder and between Front and South 1st has a two-lane urban section with no room for bike traffic, curb and gutter, and sidewalks on both sides. The remainder of Orange has a four-lane urban section with 14-foot-wide outside lanes allowing bicycle travel adjacent to vehicle traffic, curb and gutter, and sidewalks on both sides. Stephens Avenue north of Mount has a two-lane urban section with 15-foot-wide outside lanes, wide dirt shoulders, curb and gutter, and sidewalks on both sides. Stephens south of Mount has a four-lane urban section with 14-foot-wide outside lanes, curb and gutter, and intermittent sidewalks. Key features of this corridor are outlined in **TABLE 9-11**.

TABLE 9-11
Orange Street/Stephens Avenue Corridor Summary

Feature	
Length	2.29 miles
Functional Classification	Principal Arterial
1994 Traffic Volume	15,100-21,500
2015 Traffic Volume	21,600-27,200
Number of Lanes	2-4
Posted Speed Limit	30-35
Signalized Intersections	9
High Accident Locations*	7
Bridges/Tunnels	3
Bicycle Facilities	Railroad - Broadway S. 1st - Brooks
Pedestrian Facilities	Yes

Feature	
On-Street Parking	No
Corridor Lighting	Underpass N 1st - Main/Front
Transit Service	N 3rd - Spruce Pine - Mount
Truck Route	Yes
Adjacent Land Use	Commercial
Recommended Improvements	Yes

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, signals are located at the intersections of Orange Street with Spruce Street, Broadway Street, Main/Front Streets, South 3rd Street, South 5th Street and South 6th Street, and at the intersections of Stephens Avenue with Beckwith Street, Mount Avenue, and Brooks Street. The current and projected levels of service for each of these signalized intersections are shown in **TABLE 9-12**. The signalized intersections along the corridor have pedestrian crossing facilities, and are handicapped accessible (curb ramps at all crossings).

TABLE 9-12
Orange Street/Stephens Avenue Intersection Level of Service

Intersection	**Existing (1994) L.O.S. (AM/PM)**	**Projected (2015) L.O.S. (AM/PM)**
Orange & Spruce	B/B	B/C
Orange & Broadway	B/B	B/C
Orange & Main/Front	B/B	B/C
Orange & South 3rd	B/C	B/F
Orange & South 5th	B/B	B/B
Orange & South 6th	B/B	B/B
Stephens & Beckwith	B/B	B/C
Stephens & Mount	B/B	B/C
Stephens & Brooks	C/C	C/C

The intersections of Orange Street with Spruce Street, Main Street, South 5th Street and South 6th Street, and the intersections of Stephens Avenue with Strand Avenue, Kensington Avenue and South

Avenue have been identified as high accident locations. The accident analysis is presented in Section 2.4.

The corridor includes three structures: an overpass carrying North 1st Street, the Montana Rail Link tracks and Railroad Street over Orange, a bridge over the Clark Fork River, and an overpass spanning the abandoned Old Milwaukee Railroad grade and an irrigation canal. The North 1st/Rail Link/Railroad overpass is 395 feet long and 30 feet wide, spanning a two-lane underpass with paved shoulders on each side for bicycle travel adjacent to vehicle lanes, curb and gutter, and sidewalks. The underpass has inadequate clearance for large truck traffic. The Clark Fork bridge is 503 feet long, with two lanes on a 30-foot-wide traffic surface, allowing approximately three feet on each side for bicycle travel adjacent to vehicle lanes, and five-foot-wide sidewalks on both sides. The Old Milwaukee overpass is 209 feet long, with two lanes on a 30-foot-wide traffic surface, allowing approximately three feet on each side for bicycle travel adjacent to vehicle lanes, and five-foot-wide sidewalks on both sides.

Land use adjacent to the corridor is predominantly commercial, with scattered residences, and a portion running adjacent to McCormick Park.

Projected traffic volumes indicate that portions of the corridor between I-90 and Railroad, and between Main/Front and South 3rd will require capacity-related modifications to meet the travel demand for the year 2015. The Orange Street bridge over the river is inadequate, and the railroad underpass raises concerns of air quality, safety and longevity. The width of Stephens causes problems for pedestrian crossings of that roadway.

There are a variety of improvements recommended for this corridor. Widening Orange between Main/Front and South 1st to a four-lane section, including bicycle and pedestrian facilities, reconstruction of the river bridge and removal of the abandoned railroad overpass, is a recommended CMAQ improvement. Widening the paved surface of Stephens between Orange and Mount to a four-lane section with a landscaped median and bike lanes is a recommended major improvement. Also considered is an improvement project that includes purchasing right-of-way and planting trees along Stephens Avenue between Mount and Brooks. These three projects are discussed further in Chapter 12. In addition, two major projects were considered but rejected for funding in the 20-year study period. Installation of a roadway lighting system along Stephens between Orange and Brooks was one project that was considered. The other project to be considered was the widening of Orange between I-90 and Alder to a four-lane section, including reconstruction of the railroad underpass.

9.1.7 Broadway Street Corridor (Reserve Street to Van Buren Avenue)

This corridor encompasses the portion of West Broadway and Broadway Streets between Reserve Street and Van Buren Avenue within the Missoula urban area. This corridor is signed as business route I-90 and MT Highway 200, and as U.S. Highway 12 between Madison Street and I-90, and includes most of P-71. Broadway between Reserve and Russell is a four-lane urban section with 15-foot-wide outside lanes allowing bicycle travel adjacent to vehicle traffic, curb and gutter, and sidewalks east of Mullan only. Broadway between Russell and Toole is a four-lane urban section with curb and gutter, but no bike or pedestrian facilities. Broadway between Toole and Bitterroot Branch railroad is a four-lane urban section with no room for bikes, curb and gutter, and sidewalks on both sides. Broadway between Bitterroot Branch railroad and Van Buren is a four-lane urban section with 14-foot-wide outside lanes, curb and gutter, and sidewalks on both sides. On-street parking is allowed only in the CBD area. Key features of this corridor are outlined in **TABLE 9-13**.

TABLE 9-13
Broadway Street Corridor Summary

Feature	
Length	3.23 miles
Functional Classification	Principal Arterial
1994 Traffic Volume	13,700-23,400
2015 Traffic Volume	17,500-33,000
Number of Lanes	4-5
Posted Speed Limit	30-45
Signalized Intersections	8
High Accident Locations*	9
Bridges/Tunnels	0
Bicycle Facilities	Reserve - Russell Bitterroot Branch RR-VanBuren
Pedestrian Facilities	Mullan - Russell Toole - Van Buren
On-Street Parking	CBD only
Corridor Lighting	Bitterroot Branch RR-VanBuren
Transit Service	Yes
Truck Route	Yes
Adjacent Land Use	Commercial
Recommended Improvements	Yes

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, signals are located at the intersections of Broadway Street with Russell Street, Scott Street, Orange Street, Ryman Street, Higgins Avenue, Pattee Street, Madison Street, and Van Buren Avenue. The current and projected levels of service for each of these signalized intersections are shown in **TABLE 9-14**. The capacity problem at the intersection of Broadway with Russell is mainly due to the inadequate width of the Russell Street bridge. The intersection of Broadway with Mullan Road has been identified for possible future signalization. The signalized intersections along the corridor have pedestrian crossing facilities, and are only partially handicapped accessible (curb ramps don't exist at all crossings). Additionally, the wide roadway and lack of a protective center median are barriers to pedestrians and bicyclists who attempt to cross Broadway Street.

TABLE 9-14
Broadway Street Intersection Level of Service

Intersection	Existing (1994) L.O.S. (AM/PM)	Projected (2015) L.O.S. (AM/PM)
Broadway & Russell	C/D	D/F
Broadway & Scott	B/B	B/C
Broadway & Orange	B/B	B/C
Broadway & Ryman	B/B	B/C
Broadway & Higgins	B/B	B/C
Broadway & Pattee	B/B	B/B
Broadway & Madison	B/C	C/C
Broadway & Van Buren	C/C	D/C

The intersections of Broadway Street with Reserve Street, Palmer Street, Maple Street, Nora Street, May Street, Front Street, Owen Street, Higgins Avenue, Adams Street have been identified as high accident locations. The accident analysis is presented in Section 2.4.

The corridor does not include any structures.

Land use adjacent to the corridor is predominantly commercial, with some industrial development on the west end. There is still some developable land along the corridor, particularly on the western portion. The area north of West Broadway between Reserve and Great Northern has been identified for commercial and industrial infill, as discussed in Chapter 7.

Projected traffic volumes indicate that Broadway between Russell and Toole, and between Madison and Van Buren will require capacity-related modifications to meet the travel demand for the year 2015. The portion of West Broadway between the airport and Reserve Street will also require additional capacity in the future.

The construction of new sidewalks along West Broadway between Front and Russell is a committed improvement project. The installation of corridor lighting along West Broadway between Reserve and the Bitterroot Branch railroad tracks is a recommended major improvement. Both of these projects are discussed in more detail in Chapter 12.

9.1.8 South 3rd Street Corridor (Clements Road to Orange Street)

This corridor encompasses the portion of South 3rd West and South 3rd Street between Clements Road and Orange Street within the Missoula urban area. The corridor includes all of U-8102. South 3rd between Clements and Russell has a 24-foot-wide, two-lane rural section with no bicycle or pedestrian facilities. South 3rd between Russell and Orange has a two-lane urban section with 14-foot-wide outside lanes allowing bicycle travel adjacent to vehicle traffic (east of Bitterroot Branch railroad only), curb and gutter, and sidewalks on both sides. Key features of this corridor are outlined in **TABLE 9-15**.

TABLE 9-15
South 3rd Street Corridor Summary

Feature	
Length	3.68 miles
Functional Classification (Reserve - Russell)	Minor Arterial Principal Arterial
1994 Traffic Volume	3,600-11,100
2015 Traffic Volume	4,900-14,500
Number of Lanes	2
Posted Speed Limit	25-45
Signalized Intersections	3
High Accident Locations*	3
Bridges/Tunnels	0
Bicycle Facilities	Russell - Bitterroot Branch RR
Pedestrian Facilities	Russell - Orange
On-Street Parking	No
Corridor Lighting	No
Transit Service	Hiberta - Russell
Truck Route	Grove - Orange
Adjacent Land Use	Residential
Recommended Improvements	Yes

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, signals are located at the intersections of South 3rd Street with Reserve Street, Russell Street, and Orange Street. The current and projected levels of service for each of these signalized intersections are shown in **TABLE 9-16**. The intersection of South 3rd with Russell experiences significant capacity problems. The signalized intersections along the corridor have pedestrian crossing facilities, and are handicapped accessible (curb ramps at all crossings).

TABLE 9-16
South 3rd Street Intersection Level of Service

Intersection	Existing (1994) L.O.S. (AM/PM)	Projected (2015) L.O.S. (AM/PM)
South 3rd & Reserve	C/C	C/F
South 3rd & Russell	D/D	D/E
South 3rd & Orange	B/B	B/F

The intersections of South 3rd with Reserve Street, Catlin Street, and Russell Street have been identified as high accident locations. The accident analysis is presented in Section 2.4.

The corridor does not include any structures.

Land use adjacent to the corridor is predominantly residential, with scattered businesses between Johnson and Orange. The area on both sides of South 3rd between Clements and Russell has been identified for residential infill, as discussed in Chapter 7.

Projected traffic volumes indicate that the portion of the corridor between Reserve and Orange will require capacity-related modifications to meet the travel demand for the year 2015. Reconstructing South 3rd between Reserve and Russell to a three-lane urban section, complete with bike lanes, curb and gutter, and sidewalks on both sides is a recommended major improvement. In addition, two TSM projects concerning improvements to the intersections of South 3rd with Clements and Tower are recommended. All three of these projects are discussed in more detail in Chapter 12.

9.1.9 South 5th/South 6th Street Corridor (Russell Street to Maurice Avenue)

This corridor encompasses the one-way couplet of South 5th and South 6th Streets between Russell Street and Maurice Avenue within the Missoula urban area. The corridor is signed as U.S. Highway 12 between Higgins and Maurice, and includes a portion of P-7 and portions of U-8114 and U-8118. South 5th is a westbound one-way street with a two-lane urban section with on-street parking, 14-foot-wide lanes allowing bicycle travel adjacent to vehicle traffic (west of Bitterroot Branch railroad only), curb and gutter, and sidewalks on both sides. South 6th is an eastbound one-way street with a two-lane urban section with on-street parking, curb and gutter, and sidewalks on both sides. Key features of this corridor are outlined in **TABLE 9-17**.

TABLE 9-17
South 5th/6th Street Corridor Summary

Feature	
Length	3.22 miles
Functional Classification (S. 5th: Higgins - Arthur) (S. 6th: Higgins - Maurice) (S. 5th: Arthur - Maurice)	Minor Arterial Principal Arterial Principal Arterial Collector
1994 Traffic Volume	2,000-7,100 (S. 5th) 2,100-5,300 (S. 6th)
2015 Traffic Volume	3,100-7,800 (S. 5th) 2,700-6,700 (S. 6th)
Number of Lanes	2
Posted Speed Limit	25-30
Signalized Intersections	6
High Accident Locations*	6
Bridges/Tunnels	0
Bicycle Facilities	S 5th (Russell-Bitterroot Branch RR)
Pedestrian Facilities	Yes
On-Street Parking	Yes
Corridor Lighting	S 5th (Higgins - Arthur) S 6th (Higgins - Maurice)
Transit Service	Yes
Truck Route	S 5th (Orange - Arthur) S 6th (Orange - Maurice)
Adjacent Land Use	Residential
Recommended Improvements	No

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, signals are located at the intersections of South 5th Street with Russell Street, Orange Street and Higgins Avenue, and the intersections of South 6th Street with Orange Street, Higgins Avenue and Arthur Avenue. The current and projected levels of service for each of these signals are shown in **TABLE 9-18**. The signalized intersections along the corridor have pedestrian crossing facilities, and are almost completely handicapped accessible (curb ramps at all crossings).

TABLE 9-18
South 5th/6th Street Intersection Level of Service

Intersection	Existing (1994) L.O.S. (AM/PM)	Projected (2015) L.O.S. (AM/PM)
South 5th & Russell	B/B	B/B
South 5th & Orange	B/B	B/B
South 5th & Higgins	B/B	B/D
South 6th & Orange	B/B	B/B
South 6th & Higgins	B/B	B/C
South 6th & Arthur	B/B	B/B

The intersections of South 5th Street with Russell Street, Orange Street, Higgins Avenue, and Madison Street/Maurice Avenue, and the intersections of South 6th Street with Orange Street, Ronald Avenue and Arthur Avenue have been identified as high accident locations. The accident analysis is presented in Section 2.4.

The corridor does not include any structures.

Land use adjacent to the corridor is predominantly residential, with scattered businesses. The east end of South 5th runs adjacent to Rankin Park, and the east end of South 6th runs adjacent to the University of Montana campus.

Projected traffic volumes indicate that the corridor will not require capacity-related modifications to meet the travel demand for the year 2015. However, there is a need for bicycle facilities along the corridor. The recommended major improvement project at the south end of the Madison Street river bridge will affect the corridor by shifting the eastern terminus of the one-way couplet from Maurice to Arthur. This change will keep the major flow of traffic out of the University of Montana campus. The project is discussed in Chapter 12. Some previous discussion has taken place about extending the one-way couplet to the west, but this is not considered to be desirable at this time.

9.1.10 South Avenue Corridor (Clements Road to Arthur Avenue)

This corridor encompasses the portion of South Avenue between Clements Road and Arthur Avenue within the Missoula urban area. The corridor includes all of U-8120. South Avenue between Clements and Reserve has a two-lane rural section with no bicycle or pedestrian facilities. South between Reserve and Brooks/Russell has a two-lane section with no room for bicycle traffic, and curb and gutter and sidewalk on both sides except between Clark and Johnson. South between Brooks/Russell and Arthur has a two-lane urban section with 14- or 15-foot-wide outside lanes allowing bicycle travel adjacent to vehicle traffic, curb and gutter, and sidewalks on both sides except between Higgins and Arthur (north side only). Key features of this corridor are outlined in **TABLE 9-19**.

TABLE 9-19
South Avenue Corridor Summary

Feature	
Length	4.38 miles
Functional Classification (Reserve - Russell)	Minor Arterial Principal Arterial
1994 Traffic Volume	4,900-14,800
2015 Traffic Volume	7,400-18,300
Number of Lanes	2-4
Posted Speed Limit	25-45
Signalized Intersections	4
High Accident Locations*	6
Bridges/Tunnels	0
Bicycle Facilities	Brooks - Arthur
Pedestrian Facilities	Reserve - Clark Johnson - Arthur
On-Street Parking	No
Corridor Lighting	Johnson - Higgins
Transit Service	Yes
Truck Route	Reserve - Higgins
Adjacent Land Use	Residential/Commercial
Recommended Improvements	Yes

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, signals are located at the intersections of South Avenue with Reserve Street, Southgate Mall (Grant Street), Brooks Street/Russell Street, and Higgins Avenue. The current and projected levels of service for each of these signalized intersections are shown in **TABLE 9-20**. The six-way intersection of South with Brooks and Russell is widely known as "malfunction junction", and has chronic problems with congestion due to the combined traffic volumes intersecting on these three major arterials. The signalized intersections along the corridor have pedestrian crossing facilities, and are handicapped accessible (curb ramps at all crossings).

TABLE 9-20
South Avenue Intersection Level of Service

Intersection	Existing (1994) L.O.S. (AM/PM)	Projected (2015) L.O.S. (AM/PM)
South & Reserve	B/C	C/D
South & Southgate Mall	B/C	B/C
South & Brooks/Russell	D/F	F/F
South & Higgins	B/C	B/F

The intersections of South Avenue with Reserve Street, Kemp Street, Grant Street, Catlin Street, Stephens Avenue, and Higgins Avenue have been identified as high accident locations. The accident analysis is presented in Section 2.4.

The corridor does not include any structures.

Land use adjacent to the corridor is predominantly residential between Clements and Reserve, and commercial between Reserve and Higgins. Portions of South run adjacent to Fort Missoula, the County Fairgrounds, Sentinel High School and the University Golf Course. The area north of South Avenue between Clements and Reserve, and the area on both sides of South between Reserve and the Bitterroot Branch railroad tracks have been identified for residential infill, as discussed in Chapter 7.

Projected traffic volumes indicate that the portions of the corridor between 33rd Street and Brooks/Russell, and between Higgins and Arthur will require capacity-related modifications to meet the travel demand for the year 2015. Reconstructing South Avenue between Reserve and Russell to a three-lane urban section, complete with bike lanes, curb and gutter, and sidewalks on both sides is a recommended major improvement. The construction of a paved bicycle/pedestrian path along the south side of South between 38th and Reserve is a recommended CMAQ project. In addition, a TSM project concerning improvements to the intersection of South with Johnson is recommended. All three of these projects are discussed further in Chapter 12.

9.1.11 39th Street/SW Higgins Avenue Corridor (Brooks to Pattee Canyon Drive)

This corridor encompasses the portion of 39th Street between Brooks and Southwest Higgins Avenue, and all of Southwest Higgins Avenue within the Missoula urban area. The corridor includes all of U-8122. 39th Street has a 24-foot-wide, two-lane rural section with no room for bicycle traffic, a pathway on the south side only between Reserve and Arrowhead. SW Higgins is 32 feet wide with a two-lane section, including 14- or 15-foot-wide outside lanes west of Park allowing bicycle travel adjacent to vehicle traffic, and intermittent curb and gutter and sidewalk. Key features of this corridor are outlined in **TABLE 9-21**.

TABLE 9-21
39th Street/SW Higgins Avenue Corridor Summary

Feature	
Length	2.40 miles
Functional Classification	Principal Arterial
1994 Traffic Volume	9,900-14,000
2015 Traffic Volume	13,200-18,000
Number of Lanes	2-3
Posted Speed Limit	35
Signalized Intersections	3
High Accident Locations*	3
Bridges/Tunnels	0
Bicycle Facilities	SW Higgins (39th - Park)
Pedestrian Facilities	39th (Reserve - Arrowhead) 39th (Russell - SW Higgins) SW Higgins (intermittent)
On-Street Parking	No
Corridor Lighting	No
Transit Service	Gharrett - High Park
Truck Route	Yes
Adjacent Land Use	Residential (except Russell - Bancroft)
Recommended Improvements	Yes

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, signals are located at the intersections of 39th Street with 23rd Avenue/Dore Lane and with Russell Street/Hillview Way, and at the intersection of Southwest Higgins Avenue with Stephens Avenue/High Park Way. The current and projected levels of service for each of these signalized intersections are shown in **TABLE 9-22**. Four intersections have been identified for possible future signals: Southwest Higgins/Pattee Canyon, 39th Street/Reserve, 39th Street/Paxson and 39th Street/Bancroft. The existing signalized intersections along the corridor have pedestrian crossing facilities, and are handicapped accessible (curb ramps at all crossings).

TABLE 9-22
39th Street/SW Higgins Avenue Intersection Level of Service

Intersection	Existing (1994) L.O.S. (AM/PM)	Projected (2015) L.O.S. (AM/PM)
39th & Dore	B/C	B/D
39th & Russell/Hillview	B/B	B/D
SW Higgins & Stephens/High Park	B/B	B/C

The intersections of 39th Street with Brooks Street, and 23rd Avenue/Dore Lane, and Russell Street/Hillview Way have been identified as high accident locations. The accident analysis is presented in Section 2.4.

The corridor does not include any structures.

Land use adjacent to the corridor is predominantly residential with a section of commercial development between Russell and Bancroft.

Projected traffic volumes indicate that the entire corridor will require capacity-related modifications to meet the travel demand for the year 2015. This arterial provides vital access to the south hills area. Reconstructing 39th and SW Higgins between Brooks and Russell, and between Bancroft and Pattee Canyon to a three-lane urban section, complete with bike lanes, curb and gutter, and sidewalks on both sides is a recommended major improvement. Reconstruction of SW Higgins between Russell and Bancroft to a five-lane urban section, including bike lanes, curb and gutter, and sidewalks on both sides is a committed improvement project. In addition, a TSM project concerning improvements to the intersection of 39th with Reserve is recommended. All three of these projects are discussed further in Chapter 12. The intersection of 39th with Brooks should be reconfigured to eliminate left turns.

9.1.12 Van Buren Street/Rattlesnake Drive Corridor(Broadway Street-Creek Crossing)

This corridor encompasses the portion of Van Buren Street between Broadway Street and Missoula Avenue/Rattlesnake Drive, and Rattlesnake Drive between Missoula Avenue/Van Buren Street and Creek Crossing within the Missoula urban area. The corridor is signed as business route I-90 and U.S. Highway 12 between Broadway and I-90, and includes portions of P-71 and U-8115. Van Buren between Broadway and Vine has a four-lane urban section with no room for bicycle traffic, curb and gutter, and sidewalk on the east side only. Van Buren between Vine and Missoula/Rattlesnake is 30-feet-wide with a two-lane rural section with 15-foot-wide outside lanes allowing bicycle travel adjacent to vehicle traffic, and sidewalks on both sides between Poplar and Holly. Rattlesnake has a two-lane rural section with no bicycle or pedestrian facilities. Key features of this corridor are outlined in **TABLE 9-23**.

TABLE 9-23
Van Buren Street/Rattlesnake Drive Corridor Summary

Feature	
Length	2.49 miles
Functional Classification (Broadway - I-90)	Minor Arterial Principal Arterial
1994 Traffic Volume	6,100-10,000
2015 Traffic Volume	7,400-12,100
Number of Lanes	2-4
Posted Speed Limit	25-35
Signalized Intersections	1
High Accident Locations*	0
Bridges/Tunnels	0
Bicycle Facilities	Van Buren
Pedestrian Facilities	Broadway - I-90 Poplar - Holly
On-Street Parking	No
Corridor Lighting	Broadway - Holly
Transit Service	Yes
Truck Route	Broadway - Lilac
Adjacent Land Use	Residential
Recommended Improvements	Yes

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, the only signal along this corridor is located at the intersection of Van Buren Street with Broadway Street. The current and projected level of service for this signalized intersection is shown in **TABLE 9-24**. This signalized intersection does not have pedestrian crossing facilities, and is only partially handicapped accessible (curb ramps at only one corner).

TABLE 9-24
Van Buren Street/Rattlesnake Drive Intersection Level of Service

Intersection	Existing (1994) L.O.S. (AM/PM)	Projected (2015) L.O.S. (AM/PM)
Van Buren & Broadway	C/C	D/C

No high accident locations have been identified along the Van Buren Street/Rattlesnake Drive corridor.

The corridor does not include any structures.

Land use adjacent to the corridor is residential, with one business on the block south of I-90. There are three school/pedestrian crossings on Rattlesnake Drive.

Projected traffic volumes indicate that the portion of the corridor between I-90 and Holly will require capacity-related modifications to meet the travel demand for the year 2015. The Rattlesnake area has limited development potential, and it is not anticipated that overall demand on this corridor will ever reach a level that would require a four-lane roadway. Area residents have concerns about the speed of travel on the roadway, and the portion of Rattlesnake between Jennie Court and Lolo has sight distance problems. The entire corridor has been identified for development of a continuous bicycle and pedestrian facility adjacent to vehicle lanes on the roadway surface.

Paving shoulders and providing two left-turn bays along Rattlesnake between Lolo and Creek Crossing is a recommended major improvement. In addition, two other major projects were considered but not funded in the 20-year study period. Reconstruction of Van Buren between Vine and Missoula as a two-lane section with center median was a considered improvement. Widening Rattlesnake between Missoula and Lolo to a three-lane section was also considered. All three of these projects are discussed in more detail in Chapter 12.

9.1.13 South 14th Street/Mount Avenue Corridor (Reserve Street to Higgins Avenue)

This corridor encompasses South 14th Street, and the portion of Mount Avenue between Reserve Street and Margaret/South 14th and between Russell Street and Higgins Avenue within the Missoula urban area. The corridor includes all of U-8116. Mount between Reserve and Eaton has a two-lane section with on-street parking and curb and gutter on the north side only, and sidewalks on both sides. South 14th has a two-lane section with on-street parking, curb and gutter (except west of Johnson - south side only), and scattered sidewalk east of Johnson. Mount between Russell and Brooks has a two-lane urban section with 14-foot-wide outside lanes allowing bicycle travel adjacent to vehicle traffic, curb and gutter, and intermittent sidewalks. Mount between Brooks and Higgins has a two-lane urban section with on-street parking, curb and gutter, and sidewalk on the south side only. Key features of this corridor are outlined in **TABLE 9-25**.

TABLE 9-25
South 14th Street/Mount Avenue Corridor Summary

Feature	
Length	2.01 miles
Functional Classification	Minor Arterial
1994 Traffic Volume	5,300-9,300
2015 Traffic Volume	5,500-11,300
Number of Lanes	2
Posted Speed Limit	25-30
Signalized Intersections	4
High Accident Locations*	1
Bridges/Tunnels	0
Bicycle Facilities	Russell - Brooks
Pedestrian Facilities	Reserve - Eaton Johnson - Russell (scattered) Russell - Brooks (intermittent) Brooks - Higgins
On-Street Parking	Reserve - Russell Brooks - Higgins
Corridor Lighting	No
Transit Service	Eaton - Kemp Stephens - Hollis Park - Higgins
Truck Route	Johnson - Higgins
Adjacent Land Use	Residential
Recommended Improvements	Intersection only

*Locations with 12 or more accidents during the 4-year study period (1992-1995)

Currently, signals are located at the intersections of Mount Avenue with Reserve Street, Russell Street, Stephens Avenue and Brooks. The current and projected levels of service for each of these signalized intersections are shown in **TABLE 9-26**. The following intersections have been identified for possible new signals: South 14th/Johnson Street, and Mount/Hill/Higgins/Beckwith. The signalized intersections along the corridor have pedestrian crossing facilities, and are handicapped accessible (curb ramps at all crossings).

TABLE 9-26
South 14th Street/Mount Avenue Intersection Level of Service

Intersection	Existing (1994) L.O.S. (AM/PM)	Projected (2015) L.O.S. (AM/PM)
Mount & Reserve	B/B	D/F
Mount & Russell	B/C	C/D
Mount & Stephens	B/B	B/C
Mount & Brooks	B/C	B/C

The intersection of South 14th Street with Johnson Street has been identified as a high accident location. The accident analysis is presented in Section 2.4.

The corridor does not include any structures.

Land use adjacent to the corridor is predominantly residential, with some businesses near its intersections with Reserve and Higgins. The area on both sides of South 14th and Mount between Reserve and the Bitterroot Branch railroad has been identified for residential infill, as discussed in Chapter 7.

Projected traffic volumes indicate that the corridor will not require capacity-related modifications to meet the travel demand for the year 2015. The operation of the diagonal-street intersections along Mount is a safety concern due to their unique geometrics. Three projects involving improvements to intersections along the corridor are recommended. Signalization and addition of turn bays is a committed project for the intersection of South 14th and Johnson. Rerouting Mount traffic onto Hill at the east end of the corridor, and redesigning the intersection of Mount/Hill with Higgins and Beckwith are the focus of a recommended major improvement. Reconstruction of the intersections of Mount with Park, Franklin and Plymouth is a recommended TSM improvement. These projects are discussed in more detail in Chapter 12.

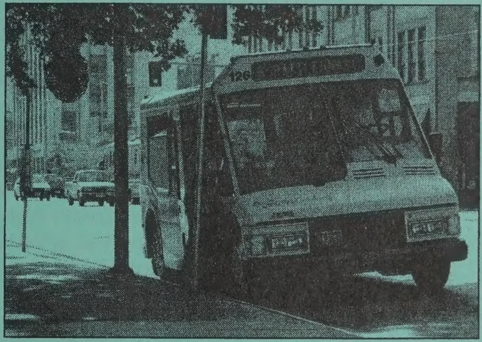
9.2 Short-Term Needs Assessment

Although there are many transportation needs that should be addressed in Missoula over the course of the next 20 years, there are several needs that should be dealt with in the short-term. There are pressing needs involving pedestrian, bicycle and transit systems; but the most important needs are located on the roadway system. If these roadway system needs are not addressed in the short-term (prior to the year 2005), significant traffic congestion problems will occur. In many cases traffic congestion problems already exist at these locations. The short-term roadway system needs are identified in **TABLE 9-27**. The recommended strategy to address these needs is by creating road improvement projects, placing them at the top of the project list, and implementing these projects prior to the year 2005.

TABLE 9-27
Short-Term Needs

Location	Need
I-90 near Airport	Provide Interstate access to airport and industrial area north of I-90
South of Airport	Construct road system grid network to structure future development
Linda Vista Drive	Extend road and connect to Miller Creek Road to provide road network for future development
Areawide	Upgrade and optimize the traffic signal system
Brooks/South/Russell	Intersection improvements to reduce traffic congestion and delays
Orange Street Bridge	Widen bridge to four lanes to handle traffic demand
North Reserve Street (I-90 to S. 3rd St.)	Widen corridor to at least four lanes to handle traffic demand
SW Higgins (Pattee to Reserve)	Widen corridor to at least three lanes to handle traffic demand
S. 3rd Street (Reserve to Russell)	Widen corridor to at least three lanes to handle traffic demand
Russell Street (S. 3rd to Bridge)	Widen corridor to at least four lanes to handle traffic demand
Russell Street Bridge	Widen bridge to four lanes to handle traffic demand
Broadway (Flynn to Airport)	Widen corridor to four lanes to handle traffic demand

Chapter 10: Transportation Demand Management



10.0 Transportation Demand Management

10.1 Role of TDM in the Plan Update

Transportation Demand Management (TDM) is an integrated set of strategies designed to reduce vehicle miles traveled (VMT) rather than accommodate them with additional road capacity. TDM is defined as:

> "Programs and policies designed to maximize the people moving capability of the transportation system by increasing the number of persons in each vehicle, (increasing the use of non-motorized travel options), or by influencing the timing of, location or need to travel." (FHWA, 1993)

TDM is an integral part of the Missoula Urban Area Transportation Plan Update because it potentially addresses several policy needs: air quality, traffic congestion, mobility, accessibility, and the desire for a sustainable community. However, TDM is not the only solution. Transportation is based on "induced demand" -- in other words, people travel to accomplish other daily pursuits such as work, school, shopping, exercise, etc. The ability to change travel behavior necessitates an appreciation of the fact that not everyone can use a travel alternative due to the complexity and nature of their daily routines.

As the Missoula urban area continues to grow in the next 19 years, the need to travel will also grow. This need can be met through a package of strategies that encourage alternative means of travel, use of incentives to promote them, public information and marketing of the strategies, and support services that make their use more convenient or remove barriers.

During the Plan update process, several public and private sector TDM strategies and implementation measures were defined, discussed, and prioritized. The Federal Highway Administration's TDM model was then used to determine the potential impacts of various packages of TDM strategies. These impacts were analyzed by region and by the Downtown, University of Montana, and Reserve Street Corridor subareas. The TTAC and TPCC selected a package of TDM measures to reduce vehicle trips by 6%. This package was included in the preliminary drafts of the Plan Update and received significant public testimony at two public hearings. (See Appendix E.)

10.2 Conclusion

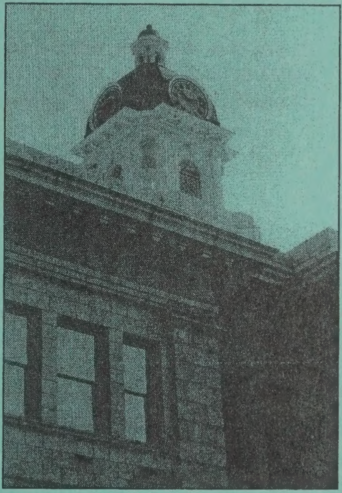
In response to public hearing testimony, the Transportation Policy Coordinating Committee added a goal to the plan to reduce projected vehicle miles traveled (VMT) by 5% within the next five years and by 10% within the next ten years. At the September 19, 1996 public hearing for the Plan

Update, neighborhood residents and business people pledged to work together with government to create a Missoula-specific package of strategies to reduce vehicle traffic.

As a first step for community discussion, the recently formed Missoula-Ravalli Transportation Management Association (MR TMA) developed a more comprehensive index of 28 TDM strategies, including a description, market or geographical setting, time frame, cost, companion strategies, effectiveness, and implementation difficulties for each one. (See Appendix F.)

The TPCC will convene a public process by July of 1997 to create a TDM plan to meet the 5% and 10% VMT reduction goals.

Chapter 11: Financing Transportation Improvements



11.0 Financing Transportation Improvements

The previous chapters of this Plan identified problems with the transportation system and recommended appropriate corrective actions. This chapter discusses the possibilities and realities of obtaining funding to implement recommended improvements to the major street network and related facilities in the Missoula urban area.

Transportation system improvements can be implemented using federal, state, local, and private funding sources. Historically, federal and state funds have been the primary source of financing projects on many of the streets and roads in and around Missoula.

The funding categories described below identify the major financing options currently available to urban areas in Montana. It should be noted that changes occur frequently in many federal and state funding programs, so the requirements of some of the programs described below could change or the programs themselves could become obsolete.

11.1 Federal Funding Sources & Programs

11.1.1 Federal-Aid Highway Program

The Federal-Aid Highway Program refers to all activities funded through the Federal Highway Administration (FHWA) and administered by the Montana Department of Transportation (MDT). This program is modified periodically through Congressional amendments to Title 23 of the U.S. Code which contains most of the laws that regulate the Federal-Aid Highway Program. These amendments define the amount of financial assistance in specific funding categories available to each state over the term listed in the Congressional Act. The Federal-Aid Highway Program has been used to fund projects on the Interstate, Primary, Secondary, Urban and State highway systems in Montana.

The resources for this federal assistance come from the "Highway Trust Fund," a funding source generated through various highway user fees. The current user fee structure is outlined in **TABLE 11-1**.

TABLE 11-1
Federal "Highway Trust Fund" User Fees

Tax Type	Rate*
Gasoline/Special Fuels/Diesohol	18.4 cents/gal (4.3 cents to the General Fund (GF))
Diesel	24.4 cents/gal (4.3 cents to GF)
Gasohol/Special Fuels with 10% alcohol	13 cents/gal (4.3 cents to GF)
Ethanol/Methanol (not made from natural gas)	12.35-12.95 cents/gal (4.3 cents to GF)
Ethanol/Methanol (made from natural gas)	11.4 cents/gal (4.3 cents to GF)

Tax Type	**Rate***
Tires	varies by weight
Truck Sales	12% retail: all tractors; trucks over 33,000 lbs GVW; trailers over 26,000 lbs GVW
Use Tax	55,000 lbs and over

* These rates include 2 cents per gallon credited to the Mass Transit Account.

The most recent reauthorization of funding for the Federal-Aid Highway Program came with the approval of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which was signed into law in December of 1991. ISTEA authorized funding from FFY 1992 through 1997. ISTEA replaced federal funding for the four federal-aid highway systems (Interstate, Primary, Secondary and Urban) with two core funding categories, the National Highway System (NHS) and the Surface Transportation Program (STP). In addition, ISTEA authorized funding for two additional programs: Bridge Replacement and Congestion Mitigation and Air Quality.

It should be mentioned that there are other federal funding categories besides the two core categories mentioned above. These categories are: Equity Adjustment funds, Federal Transit Authority funds and National Recreational Trail funds.

In 1996, the funding authorized by the federal government for the programs contained in ISTEA amounted to approximately $146.7 million. Non-federal matching funds are still required to secure federal funding assistance. The Act made adjustments to the matching fund requirements but the amount of non-federal money needed to match each federal-aid dollar changed little on the average.

Within the limits established by federal and state law, the Montana Transportation Commission allocates the funding to each respective program. Both federal and state law allow for the transfer of funds between most of the programs created under ISTEA.

11.1.2 National Highway System (NHS)

The NHS was designated by Congress on November 28, 1995 and consists of Interstate and most of the principal arterials in Montana. Federal funding allocated for the NHS in FFY95 was approximately $43.8 million. Federal participation for eligible projects is 86.58 percent.

Within metropolitan areas, priorities for the NHS system are established by the MDT through the metropolitan planning process and must be approved by the Montana Transportation Commission and Federal Highway Administration.

Activities eligible for funding on the NHS system include:

- ☐ construction, reconstruction, resurfacing, restoration and rehabilitation,
- ☐ operational improvements,
- ☐ construction of and operational improvements for, a Federal-aid highway not on the NHS

and construction of a transit project eligible under the Federal Transit act in the corridor of fully access-controlled NHS routes. These projects must be cost effective and improve the level of service on the NHS segment,

- ☐ highway safety improvements,
- ☐ transportation planning, highway-related technology transfer activities and research and development,
- ☐ start up costs for traffic management and control (limited to 2 years),
- ☐ fringe and corridor parking facilities,
- ☐ carpool and vanpool projects,
- ☐ improvements necessary to accommodate other transportation modes,
- ☐ development and establishment of management systems (highway pavement equipment, and intermodal transportation facilities and systems), and
- ☐ wetland mitigation and wetland banking.

11.1.3 Interstate Maintenance Program (IM)

As part of the NHS, additional funds have been apportioned for rehabilitating, restoring and resurfacing the Interstate system in Montana under the Interstate Maintenance Program. These funds may also be used for reconstruction projects on the Interstate system if the capacity of the facility is not increased. This program is similar to the previous Interstate 4R Program. Federal participation for eligible projects is 91.24 percent. Federal funding allocated for the Interstate system in FFY95 was approximately $42 million. It should be mentioned that MDT transferred 20% of this amount to the NHS program.

Within the metropolitan areas, priorities for the IM program are established by the MDT through the metropolitan planning process and must be approved by the Montana Transportation Commission and Federal Highway Commission.

11.1.4 Surface Transportation Program (STP)

The STP is a flexible block grant type program. Federal law requires that 20% of STP funds be set aside for the Safety and Enhancement program. The remaining STP funds are distributed to the urban, secondary, primary and state highways construction programs.

Safety Program

By federal regulation, ten percent of the STP monies must be set aside for safety construction activities. The safety set aside funds can be used for activities such as eliminating hazards, improving rail-highway crossings, and constructing grade separations of highway and rail facilities, similar to the Hazard Elimination Program in previous Highway Acts. The funds can be spent on any public road in which a high accident or hazard location has been identified. Total funds for these types of projects in FFY95 were $6 million: $1.1 million for Railroad Protective Devices, $900,000 for Railroad Hazard Elimination, and $4 million for Hazard Elimination. The federal share for these projects is 90%.

For projects located in the metropolitan area to be eligible for safety funds, the local authorities must provide a certain amount of accident analysis for locations they consider to be candidates for the program. The urban locations compete with locations throughout the state on a Benefit Cost basis. The locations are prioritized by Benefit Cost with the highest priority locations (projects) being implemented. The safety projects that are within the metropolitan planning area must be included in an approved TIP. The safety projects must also be approved by the Montana Transportation Commission and Federal Highway Commission.

Enhancement Program

By federal regulation, ten percent of STP monies must also be set aside for the transportation enhancement program. The state in cooperation with the Montana Association of Counties and the Montana League of Cities and Towns established the Community Transportation Enhancement Program (CTEP). The funds are suballocated to all of the counties and to cities/towns with populations of 1,000 or greater based on relative population.

The department also retains a portion of this set aside for use statewide. Enhancement project nominations are requested from MDT divisions which are reviewed and prioritized by the MDT Enhancement Selection Committee. The MDT portion of STP Enhancement funds in FFY95 was $1 million. The STP Enhancement funds suballocated to cities and towns totaled $5 million for the same period. The federal share for projects in this program is 86.58%.

The "set aside" for transportation enhancement must be used for:

- pedestrian and bicyclist facilities,
- acquisition of scenic easement and scenic or historic sites,
- scenic or historic highway programs,
- landscaping and scenic beautification,
- historic preservation,
- rehabilitation and operation of historic transportation buildings, structures, or facilities including historic railroad facilities and canals,
- preservation of abandoned railroad corridors including the conversion and use thereof for pedestrian and bicyclist trails,
- control and removal of outdoor advertising,
- archaeological planning and research, and
- mitigation of water pollution due to highway runoff.

State Urban Program (STPU)

Urban funds are allocated based on each city's population. STP funds for FFY95 allocated to the State Urban System totaled $4.5 million. In metropolitan areas urban program priorities are established by the Metropolitan Planning organization Policy body. All projects must be approved by the Transportation Commission and the Federal Highway Administration.

Activities eligible for funding on the State Urban System include:

- construction of new facilities,
- reconstruction, resurfacing, restoration and rehabilitation of existing facilities,
- operational improvements,
- safety improvements and wetland mitigation,
- bicycle facilities and pedestrian walkways, and
- carpool and vanpool projects.

State Secondary Program (STPS)

STP funds are suballocated to the Secondary System. Secondary funds are allocated based on each county's land area, rural population, rural road miles and rural land values. STP funds allocated to the State Secondary System in FFY95 totaled $13.1 million. The federal share for eligible projects is 86.58%.

Projects are prioritized by the county commissions in cooperation with the Department's District Administrators and the Secondary Roads Engineer. Projects located within the metropolitan area must advance through the metropolitan planning process. All projects must be approved by the Transportation Commission and the Federal Highway Administration.

The type of improvements eligible for funding on the State Secondary System are primarily reconstruction, resurfacing, restoration and rehabilitation of existing facilities.

State Primary Program (STPP)

The Surface Transportation Funds remaining after mandatory set-asides and suballocation to the urban, secondary and state highway systems are distributed to the State Primary system. Primary funds, totaling $45.4 million in FFY95, are allocated to financial districts based on mileage rated below adequate sufficiency and mileage rated at or below critical sufficiency in each district.

The MDT selects the projects for the State Primary program. Projects located within the metropolitan area must advance through the metropolitan planning process. All projects must be approved by the Transportation Commission and the Federal Highway Administration.

The type of improvements eligible for funding are typically the same as those for the urban system. In the past, the funds have been predominantly used for reconstruction, resurfacing, restoration and rehabilitation of existing facilities.

State Highways Program (STPX)

The suballocation of STP funds to this program are used on local state maintained roads referred to as "orphan plant roads" in the past. The priorities are established by the MDT. STP funds allocated to this program in FFY95 totaled $200,000. In the past, the type of improvements for this program have been epoxy pavement markings and guardrail improvements. Projects nominated under this program compete against primary funds.

11.1.5 Bridge Replacement and Rehabilitation Program (BRR)

Prior to ISTEA, the Bridge Replacement and Rehabilitation Program existed. The program was continued under the ISTEA. This program provides federal funding assistance (80 percent of eligible costs) for correcting deficiencies on any bridge on a public road. By federal regulation, 65% of the BRR funds are to be used for on-system improvements, 15% for off-system improvements and the remaining 20% is optional. The ISTEA allows up to 40 percent of the state bridge funds to be transferred to the NHS or STP. For FFY95 about $11 million was available.

Project priorities are established by the MDT on a statewide basis using a system that rates bridge deficiencies. Projects located within a metropolitan area must advance through the metropolitan planning process. All projects must be approved by the Transportation Commission and the Federal Highway Administration.

11.1.6 Congestion Mitigation and Air Quality Improvement Program (CMAQ)

The ISTEA makes funding available for transportation projects in locations designated as non-attainment areas for ozone and carbon monoxide (CO) under the provisions of the Clean Air Act Amendment (CAAA) of 1990. Missoula is the only urban area in the state that is a non-attainment area for carbon monoxide.

Under certain conditions, transportation projects and programs targeting small particulate matter (PM-10) are also eligible. States may use CMAQ funds in any of their PM-10 nonattainment areas if the following requirements are met, as stated in the July 13, 1995 revised guidance document:

- The State must consult with, and consider the views of, the metropolitan planning organizations (MPO's) in all nonattainment areas within the State before programming CMAQ funds for a PM-10 project. The State must obtain the concurrence only of the MPO in whose jurisdiction the project is to be implemented.

- The EPA regional office must agree that the proposed use of CMAQ funds for PM-10 projects or programs will not detract from or delay efforts to attain the ozone or CO standards.

The CMAQ eligibility of PM-10 projects will not affect a State's CMAQ apportionment, but has the potential to spread the limited CMAQ funds over a greater number of nonattainment areas within the state. The federal share for most CMAQ projects is 86.58%.

Montana has two CO "not classified" areas located in Great Falls and Billings. These areas have technically reached attainment for CO but have not been officially redesignated. The most recent guidance in this area states:

> - Funding under the CMAQ program may not be used in areas that are designated as nonattainment by operation of law prior to enactment of the CAAA of 1990. These include but are not limited to the ozone "transitional" and "incomplete data" areas and the CO "not classified" areas. In addition, CMAQ funds may not be used in "maintenance" areas that were classified as nonattainment under the CAAA of 1990 but have been redesignated to attainment by EPA, except under the conditions explained in Section III.B.5 of the guidance.
>
> - Section III.B.5 relaxes the policy to allow for a transition period after an area is redesignated to attainment. Projects (or phases thereof) that are programmed in the first 2 years of the TIP that is in effect at the time of redesignation to attainment are eligible for CMAQ funding. This new policy will provide for the continuity of an area's planning process as it relates to reducing transportation emissions.

11.1.7 Equity Adjustment Funds

Equity adjustment categories included in the ISTEA are funds that were legislated to achieve equity in funding levels among various states. The monies are not directed towards specific roads or activities and cannot be considered programs for this reason. Adjustments include Minimum Allocation, (23 U.S.C. 157), Donor State Bonus (23 U.S.C. 1013(c)), Hold Harmless (23 U.S.C. 1015(a)), 90 Percent of Payments Adjustment (23 U.S.C. 1015(b)), and Reimbursement for Interstate Segments (23 U.S.C. 160). Federally determined formulas are used to calculate these adjustments. With the exception of Minimum Allocation, the funds are used as STP funds, with one-half of the amount received subject to the two set-aside requirements for the Enhancement and Safety program. Minimum Allocation funds may be allocated for use to any federal highway program. The state of Montana has received funds from the Hold Harmless and Reimbursement for Interstate Segments fund categories.

11.1.8 Federal Transit Authority Funds

The ISTEA did not substantially revise the program requirements or structure of the previous program to be more flexible. The Urban Mass Transit Administration was renamed the Federal Transit Administration. Additionally, a new comprehensive transit planning and research program was established under the Act.

Federal funding assistance for transit is available under the Section 5309 (formerly Section 3) discretionary program, the Section 5311 (formerly Section 18) program, and the Section 5310 (formerly Section 16) program. The Section 5309 program is available for funding capital improvements to urban transit systems including non-urbanized areas. Section 5311 provides monies to rural areas on the basis of a statutory formula. Section 5310 funds are available to provide capital assistance for transportation services for the elderly and disabled. These funds may go to private, nonprofit organizations, or to public bodies that coordinate transportation for these specific groups. According to information from MDT Urban Planning the Federal matching ratios are as follows:

- Section 5307 (formerly Section 9) for operating and capital expenditures, 50% match for operating & 80% match for capital.
- Section 5309 (formerly Section 16) for elderly and handicapped transit services, 70% match.
- Section 5310 (formerly Section 8) for transit planning, 80% match.

MDT Urban Planning Section provided the following information on transit annual funding levels for the Missoula Urban Area for FFY 1995:

• Section 5307 - Operating	$208,525
- Capital	$166,041
• Section 5309 - Elderly & Handicapped	$ 45,000 (multi-year average)
• Section 5310 - Planning	$ 42,400

Since these federal matching funds are designated for very specific transit uses, these dollar amounts are not included in the table listing available funding for transportation projects later in this chapter.

11.1.9 National Recreational Trails Funding Program

The ISTEA established this program for use in constructing and maintaining recreational trails for both motorized and non-motorized recreation. Each state will receive nearly $300,000 in base funding each year with additional funds based on gasoline consumption and each state's non-highway recreational fuel taxes. It is estimated that Montana will receive around $250,000 with some adjustments for FY96 and FY97. The program was originally set up to distribute 30 percent of the funds for non-motorized trails and 30 percent for motorized trails. The remainder of the funds are intended to be used for multiple-use projects. These funds may be used for the maintenance of existing trails, development of new trails or trailhead facilities, and the acquisition of easements or property for trail corridors. The Montana Fish, Wildlife and Parks - Parks Division administers the program.

11.1.10 ISTEA Effects on Montana

TABLE 11-2 shows Montana's federal apportionment for FFY 1995 by various funding programs under the ISTEA.

TABLE 11-2
1995 ISTEA Apportionments for Montana

Funding Category	Apportionment
Interstate Maintenance (IM)	$ 42.4 Million
National Highway System (NHS)	$ 35.4 Million
Bridge Replacement and Rehabilitation (BRR)	$ 11.1 Million
Surface Transportation Program (STP)	$ 75.7 Million
Congestion Mitigation and Air Quality (CMAQ) Improvement Program	$ 4.7 Million
Equity Adjustment	$? Million
State Planning & Research (SPR)	$ 4.1 Million
Total	**$173.4 Million**

11.1.11 Other Federal Sources

Based on information received from the Montana Department of Commerce, Local Government Assistance Division, there are a few additional sources of federal funding for transportation-related projects. RECD Rural Business Enterprise Grants, administered by the USDA-Rural Economic & Community Development (RECD), offers grants to public agencies for acquisition and development of land, construction of streets and roads, and related economic development. EDA Grants for Public Works & Facilities, administered by the Economic Development Administration (EDA), provides grants to municipalities and counties for the construction and rehabilitation of public facilities necessary for the establishment or expansion of commercial or industrial firms in the community. The Highway Traffic Safety Program, administered by the MDT, offers grants to municipalities and counties to conduct high accident location studies. Land and Water Conservation Funds, administered by the Montana Department of Fish, Wildlife, and Parks, are grants available to municipalities and counties for construction, acquisition, and development of outdoor recreation facilities for public use (including bikeways).

11.2 State Funding Sources

In 1983, the State Legislature established the Reconstruction Trust Fund (RTF) to address the shortfalls of the Federal-Aid Program. The revenues for this fund are generated in part by a state tax of 27 cents per gallon on gasoline and diesel and through an allotment of the state's coal severance tax (currently 12%).

Additional revenue for transportation projects in Montana is generated by a 1.5 percent sales tax on all new vehicles (MCA 61-3-502) and through a graduated trailer tax, based on GVW, beginning at 2,500 pounds. The revenue from these taxes is put in the state Special Reserve account and is used to match Federal-Aid dollars.

11.2.1 Reconstruction Trust Fund

The department, with approval of the Transportation Commission set up two programs for the 1995 biennium, the Pavement Preservation program and the Save our Secondaries program.

Pavement Preservation Program - The Pavement Preservation program ($5 million/year) funds projects located on the NHS, State Primary, state-maintained urban routes and state highways previously referred to as "orphan plant roads".

Save Our Secondaries Program - The Save Our Secondaries program ($15 million/year) funds projects located on state and non-state maintained secondary routes. By MDT policy, the department allocates the program funds among the department's five administrative districts.

The MDT Maintenance Bureau also receives a portion of the revenues generated by the state fuel tax for use in direct maintenance expenditures by the agency and through contracted maintenance with cities in Montana. These apportionments can only be used for materials and labor required for road reconstruction and maintenance.

MDT Urban Planning Section provided the following information on State Gas Tax funds apportioned to the City and County of Missoula for FFY 1995:

City	**$895,199**
County	**$316,261**

Since these gas tax funds are used exclusively for maintenance activities on existing roads, these dollar amounts are not included in the table listing available funding for transportation projects later in this chapter.

11.2.2 Other State Sources

Based on information received from the Montana Department of Commerce, Local Government Assistance Division, there are a few additional sources of state funding for transportation-related projects. The Intermediate Term Capital Program (Intercap), administered by the Montana Board of Investments, offers capital loans to municipalities and counties to purchase and install traffic signals, construct and repair sidewalks, and other public facilities. The Highway Traffic Safety Program, administered by the MDT, offers grants to municipalities and counties to conduct high accident location studies. The Treasure State Endowment Program (TSEP), administered by the Montana Department of Commerce, provides grants and loans to cities and counties for bridge and other types of public infrastructure projects. Land and Water Conservation Funds, administered by the Montana Department of Fish, Wildlife, and Parks, are grants available to municipalities and counties for construction, acquisition, and development of outdoor recreation facilities for public use (including bikeways).

11.3 Local Funding Sources

Local governments generate revenue through a variety of funding mechanisms. Typically, several local programs related to transportation exist for budgeting purposes and to disperse revenues. These programs are tailored to fulfill specific transportation functions or provide particular services.

The following text summarizes programs that relate to transportation in the City and County. This information is based on programs contained in the FY 1995 and 1996 budgets.

11.3.1 City of Missoula

General Fund - This fund provides revenue for most major City functions like the administration of local government, and the departments of public services, police, fire, and parks. Revenues for the fund are generated through the general fund mill levy on real and personal property and motor vehicles, licenses and permits, state and federal intergovernmental revenues, intergovernmental fund transfers, and charges for services.

Several transportation-related services are supported by this fund including public services (engineering and streets) and the City of Missoula Police Department. The street department is responsible for maintaining the City streets and alleys including: pavement repair, street cleaning, striping and signing, lighting and traffic signal maintenance, and plowing and sanding during the winter. In addition to revenue from the General Fund, the costs of operating the street department come from gas tax funds and street maintenance district funds. The police department is obviously responsible for enforcing traffic laws on the street system.

Although most of the highway-designated monies are oriented toward maintenance activities, some new construction and street-widening projects may be financed through the General Fund. This revenue source has been used in conjunction with other resources to finance local street and highway projects.

Special Revenue Funds - These funds are used to budget and distribute revenues legally restricted to a specific purpose. Several such funds that benefit the transportation system are discussed briefly in the following paragraphs.

Missoula Redevelopment Agency (MRA) - This fund generates revenue through tax increment financing in the CBD area since 1978. The original tax increment district was enlarged in 1991 to gain more comprehensive coverage of the CBD area. MRA funds are used to provide services such as land acquisition, street and parking improvements, beautification, planning, and management to a specific area in the CBD. The purpose of this agency is the preservation of existing public investments and promotion of private businesses in the downtown area.

SID Revolving Fund - This fund provides financing to meet bond payments for special improvement districts with insufficient funds. The City can establish street SID's, with bond repayment to be made by the adjoining landowners receiving the benefit of the improvement. The City has provided labor and equipment for past projects through the General Fund, with an SID paying for materials.

Gas Tax Apportionment - Revenues are generated through State gasoline taxes apportioned from the State of Montana. Transfers are made from this fund to the General Fund to reimburse expenditures for construction, reconstruction, repair and maintenance of streets. Half of the City's allocation is based on population and half is based on the miles of streets and alleys in the City. The City Gas Tax Fund received an allocation of $895,199 for FY 1995.

Community Development Block Grant (CDBG) Program - This program is used to administer Federal funds budgeted to specific CDBG sites. The fund is not a reliable source of financing for transportation system improvements, as it is reserved for CDBG projects.

Missoula Parking Commission - This program is funded by monthly least rental payments and meter collections. Revenues are used to fund parking improvements in the downtown area.

Capital Improvements Fund - This fund is used to finance major capital improvements to the City's infrastructure. Capital expenditures are planned through the five-year Capital Improvements Program. Fund revenues are generated by user fees and transfers from other funds (mainly from the general fund). These funds have been used for major equipment purchases and repair of municipal non-highway facilities such as buildings, parks, and tennis courts in the past. Major street construction projects are eligible for financing through this fund.

Enterprise Funds - This fund was established to administer revenues generated solely from user fees for specific improvement projects. Typically, this funding mechanism has been used to finance water, wastewater, and solid waste management projects in Missoula. Major highway construction projects would be eligible for this type of funding if an equitable system of user fees could be established.

Missoula Urban Transportation District (MUTD) - This district was established by Missoula area voters in 1976, pursuant to state law, to provide local public transportation services. Revenues for MUTD come from property taxes (9.82 mill levy), state and local motor vehicle taxes, state and federal operating assistance, FTA Section 5307, 5309 and 5310 funds, CMAQ funds, and operating receipts from fares and passes. The Mountain Line System provides fixed route and special transit services throughout the Missoula urban area.

11.3.2 Missoula County

Road Fund - The County Road Fund provides for the construction, maintenance, and repair of all county roads outside the corporate limits of cities and towns in Missoula County. Revenue for this fund comes from intergovernmental transfers (i.e. State gas tax apportionments and motor vehicle taxes), and a mill levy assessed against County residents living outside cities and towns. The county mill levy has a ceiling limit of 15 mills. Missoula County's FY 1995 state gas tax apportionment added nearly $316,261 to the Road Fund.

County Road Fund monies are primarily used for maintenance with little allocated for new road construction. It should be noted that only a small percentage of the total miles on the county road system are located in the study area. Projects eligible for financing through this fund will be competing for available revenues on a county-wide basis.

Bridge Fund - The Bridge Fund provides financing for engineering services, capital outlays, and necessary maintenance for bridges on all off-system and Secondary routes within the County. These monies are generated through intergovernmental fund transfers (i.e. vehicle licenses and fees), and a county-wide mill levy. There is a taxable limit of four mills for this fund.

Rural Special Improvement District (RSID) Revolving Fund - This fund is used to administer and distribute monies for specified RSID projects. Revenue for this fund is generated primarily through a mill levy and through motor vehicle taxes and fees. A mill levy is assessed only when delinquent bond payments dictate such an action.

Special Bond Funds - A fund of this type may be established by the County on an as-needed basis for a particularly expensive project. Authorization for a special bond fund must be approved by the voters.

Capital Improvements Fund - This fund is used to finance major capital improvements to County infrastructure. Revenues are generated by loans from other county funds, and must be repaid within ten years. Major road construction projects are eligible for this type of financing.

Specialized Transportation Fund - This fund was established to supplement the cost of bus service to disabled county residents. Mountain Line is currently contracted to provide these services.

11.4 Private Funding Sources

Private financing of highway improvements, in the form of right-of-way donations and cash contributions, has been successful for many years. In recent years, the private sector has recognized that better access and improved facilities can be profitable due to increases in land values and commercial development possibilities. Several forms of private financing of transportation improvements used in other parts of the U.S. are described in this section.

11.4.1 Joint Development

Joint development refers to agreements between the public and private sectors to share the costs associated with planning and developing transportation facilities. Joint development can take several forms as described in the following text.

Development Financing - The developer provides the land for a transportation project and in return, local government provides the capital, construction, and necessary traffic control. Such a financing measure can be made voluntary or mandatory for developers.

Cost Sharing - The private sector pays some of the operating and capital costs for constructing transportation facilities required by development actions.

11.4.2 Transportation Corporations

These private entities are non-profit, tax exempt organizations under the control of state or local government that are created to stimulate private financing of highway improvements.

11.4.3 Road Districts

These are areas created by a petition of affected landowners, which allow for the issuance of bonds for financing local transportation projects.

11.4.4 Private Donations

The private donation of money, property, or services in exchange for modifications in zoning or other considerations, is the most common type of private transportation funding. Private donations are very effective in areas where financial conditions do not permit local government to implement a transportation improvement themselves.

11.4.5 Private Ownership

This method of financing is an arrangement where a private enterprise constructs and maintains a transportation facility, and the government agrees to pay for public use of the facility. Payment for public use of the facility is often accomplished through leasing agreements where the facility is rented from the private owner, or through access fees, where the owner is paid a specified sum depending on the level of public use.

11.4.6 Privatization

Privatization is the temporary or long-term transfer of a public property or publicly-owned rights belonging to a transportation agency to a private business. This transfer is made in return for a payment that can be applied toward construction or maintenance of transportation facilities.

11.4.7 Other Private Sources

Based on information received from the Montana Department of Commerce, Local Government Assistance Division, there are a few additional sources of private funding for transportation-related projects. The Federal Express Corporation offers grants to local governments for arts, education, civic, health and human services projects (including sidewalks and bikeways). The Montana Community Foundation offers grants to local governments for projects related to arts and culture, basic human needs, economic vitality, education, and natural resources and conservation (including sidewalks, bikeways, and bus systems for the elderly and disabled). The American Honda Motor Company provides grants to local government agencies for health, youth and aged, and cultural and performing arts projects (including bikeways).

11.5 Local Funding Alternatives

The previous sections of this chapter reviewed the traditional sources of revenue used to fund transportation improvements. Due to annual variations in tax revenues with corresponding changes in the budgets and modifications to federal and state programs, it has become necessary for local government to rely on alternate funding sources. The mechanisms discussed below are considered as the most viable sources for financing transportation improvements in the Missoula Urban Study Area. Some of these financing options, like general obligation bonds and increment financing have been or are being used by local government to fund infrastructure improvements.

11.5.1 Local Option Gas Tax

State law allows for the establishment of a county-wide local option gas tax of up to two cents per gallon if the measure is approved by the voters in the county. A fund of this nature could provide for the implementation of many recommended transportation improvements contained in this Plan, and is considered to be an excellent potential source of local funds. The primary advantage offered by such a mechanism is that only the users (both residents and visitors) of the transportation system are taxed. Fees paid by individual users would vary according to their use of the transportation system. An estimated fuel consumption rate of 2.5 million gallons per month in Missoula County would generate revenues of $600,000 annually for the County.

11.5.2 Transportation Utility

A transportation utility could be created that would assess user fees from local residents each year. Specific projects would be funded through an enterprise fund similar to that established by the City of Missoula for the operation of its sewer utilities. A transportation utility would provide a dependable and continuous funding source with the flexibility to adjust the user fee structure to accommodate future project needs.

11.5.3 General Obligation (G.O.) Bonds

The sale of general obligation bonds could be used to finance a specific set of major highway improvements. A G.O. bond sale, subject to voter approval, would provide the financing initially required for major improvements to the transportation system. The advantage of this funding method is that when the bond is retired, the obligation of the taxpaying public is also retired. The use of G.O. bonds is restricted by state statutes limiting the level of bonded indebtedness for cities and counties. The present property tax situation in Montana and recent adverse citizen responses to proposed tax increases by local government, would suggest that the public may not be receptive to the use of this funding alternative.

11.5.4 Development Exactions/Impact Fees

As mentioned in the section on private funding sources, exaction of fees or other considerations from developers in return for allowing development to occur can be an excellent mechanism for improving the transportation infrastructure. Developer exactions and fees allow growth to pay for itself. The developers of new properties should be required to provide at least a portion of the added transportation system capacity necessitated by their development, or to make some cash contribution to the agency responsible for implementing the needed system improvements.

Establishment of an equitable fee structure would be required to assess developers based on the level of impact to the transportation system expected from each project. Such a fee structure could be based on the number of additional vehicle trips generated, or on a fundamental measure such as square footage of floor space. Once the mechanism is in place, all new development would be reviewed by local government and fees would be assessed accordingly.

11.5.5 Tax Increment Financing (TIF)

Increment financing has been used in many municipalities to generate revenue for public improvements projects. As improvements are made within the district and property values increase, the incremental increases in property tax revenue are earmarked for this fund and used for improvements within the district. Expenditures of revenue generated by this method are subject to certain spending restrictions and must be spent within the district. Tax increment districts could be established to accomplish transportation improvements in other areas of the community where property values may be expected to increase.

The MRA in downtown Missoula is a current TIF-funded improvement district. Past MRA projects include street and parking improvements, and tree planting, installation of new bike racks, trash containers and benches for street beautification in the CBD. Additional TIF districts could be established in other areas of the city to accomplish a variety of transportation-related improvements.

11.5.6 Multi-Jurisdictional Service District

This funding option was authorized in 1985 by the State Legislature. This procedure requires the establishment of a special district, somewhat like an SID or RSID, which has the flexibility to extend across city and county boundaries. Through this mechanism, an urban transportation district could be established to fund a specific highway improvement that crosses municipal boundaries (corporate limits, urban limits, or county line). This type of fund is structured similar to an SID with bonds backed by local government issued to cover the cost of a proposed improvement. Revenue to pay for the bonds would be raised through assessments against property owners in the service district.

11.5.7 Local Improvement District

This funding option is only applicable to counties wishing to establish a local improvement district for road improvements. While similar to an RSID, this funding option has the benefit of allowing counties to initiate a local improvement district through a more streamlined process than that associated with the development of an RSID.

11.5.8 Other Local Option Taxes

The State Legislature recently authorized some local governmental entities in Montana to institute local option taxes, such as a local sales tax or hotel bed tax. West Yellowstone and Big Sky have implemented local option taxes to fund needed improvements in their communities. Other states allow municipalities to implement certain forms of local option taxes, and these types of measures are periodically considered by the Montana Legislature. As these optional taxes become authorized for use in the State, local governments will gain additional flexibility in meeting financial needs.

House Bill 312, passed by the 1991 State Legislature, authorizes counties to impose a local option vehicle tax of 0.5 percent on the depreciated wholesale value of cars and light trucks licensed in the county. The authority to implement this tax ended on June 30, 1993.

11.5.9 Other Local Option Sources

Based on information received from the Montana Department of Commerce, Local Government Assistance Division, there are a few additional sources of local funding for transportation-related projects. Street Maintenance Districts provide a method for municipalities to fund various road maintenance activities. Road and Bridge Depreciation Funds, effective in 1989, provide financing to counties for acquisition and replacement of property, capital improvements, and equipment to improve and maintain county roads and bridges. Municipal Lease-Purchase Financing provides a method for municipalities to perform new construction or rehabilitation allowed under municipal leasing statutes or the federal income tax code. The Montana League of Cities and Towns, and the Montana Association of Counties are the contact agencies for these programs.

11.6 Summary of Current Financial Status

Current financial information was obtained from the MDT District Office and MDT's Urban Planning Section to get a picture of the projected revenue available for funding transportation projects in the Missoula urban area over the next 20 years. This information is summarized in **TABLE 11-3**.

TABLE 11-3
Projected Funding Available for Transportation Projects

Funding Source	Current Account Balance*	Current Annual Allocation	Projected Annual Allocation	Revenue Projection 2005	Revenue Projection 2015
STP- Urban	$(1,080,554)	$ 685,412	$ 685,412	$ 5.1 M	$ 12.6 M
STP- Primary				$ 1.0 M	$ 2.0 M
STP- Secondary				$ 0.5 M	$ 1.0 M
STP- Enhancement (City)	$ 454,605	$ 208,000	$ 208,000	$ 2.3 M	$ 4.6 M
(CTEP) (County)	$ 465,403	$ 174,000	$ 174,000	$ 2.0 M	$ 1.2 M
NHS				$ 6.0 M	$ 12.0 M
BRR				$ 2.5 M	$ 5.0 M
CMAQ	$13,732,144	$4,201,896	$4,050,000**	$ 31.0 M	$ 40.0 M
Demonstration (DPI)	$ 2,590,465	$1,288,000	$1,288,000***	$ 7.6 M	$ 10.0 M
State Match				$ 6.2 M	$ 9.5 M
City General Fund			$ 100,000****	$ 1.0 M	$ 2.0 M
County Road Fund			$ 50,000****	$ 0.5 M	$ 1.0 M
Other (SID, RSID, TIF, Private, G.O. Bonds, etc.)				$ 8.5 M	$ 17.0 M
Total				**$ 74.2 M**	**$117.9 M**

Notes: Although ISTEA only provides for Federal funding through FFY97, 2005 and 2015 projections are based on continuance of current levels of funding unless otherwise noted.
Estimated Federal fund allocations do not include amount of any required local matching funds.
FTA, Planning, and State Gas Tax funds are not included in this table, but are discussed under the appropriate previous section of this chapter.

* Unobligated Carryover Balance (9/30/95) per MDT Urban Planning
** Allocations beyond ISTEA (9/30/97) are being estimated at $1,000,000/year per MDT Urban Planning.
*** Last allocation in FFY 1997 per MDT Urban Planning Section.
**** Administrative management support for projects.

2015 Calculations: STPU = $-1,080,554 carryover + $685,412 x 20 yrs
STPP = $10m/yr District-wide; $2m = 20yr estimate available to Missoula Urban Area (MUA)
STPS = $-4m + $388,000 x 20 yrs = $3.8m Missoula County; $1m = 20yr estimate available to MUA
CTEP = City: $454,605 carryover +$208,000 x 20yrs; County: $465,403 carryover +$174,000 x 20yrs
NHS = $12m = 20yr estimate available to MUA
BRR = $5m = 20yr estimate available to MUA
CMAQ = $13.7m (carryover) + $4.2m (est. 96) + $4.1m (est. 97) + $1m x 18 yrs
2005 Calculations: Estimates based on 2015 data but adjusted for nine years.

11.7 Financial Analysis

The previous sections of this chapter have outlined the various sources and projected levels of funding for transportation related improvements in the Missoula urban area. Anticipated funding requirements for the next 20 years include the costs of implementing the committed improvements, CMAQ improvements, recommended major network improvements, TSM improvements, and recommended programs described in Chapter 7.

TABLE 11-4 compares the projected funding supply with the anticipated funding requirements through the year 2005 and 2015.

TABLE 11-4
Funding Supply vs. Funding Requirements

Funding Supply - Program	2005 Projected Funds	2015 Projected Funds
Federal	$ 58.0 million	$ 88.4 million
State	$ 6.2 million	$ 9.5 million
City	$ 1.0 million	$ 2.0 million
County	$ 0.5 million	$ 1.0 million
Local	$ 8.5 million	$ 17.0 million
Total Funding Supply	**$ 74.2 million**	**$117.9 million**
Funding Requirements	**2005 Projected Needs**	**2015 Projected Needs**
Committed Improvement Projects	$ 32.5 million	$ 32.5 million
Recommended CMAQ Improvement Projects	$ 21.8 million	$ 39.6 million
Recommended Major Improvement Projects	$ 15.3 million	$ 36.4 million
Recommended TSM Improvement Projects	$ 0.6 million	$ 0.6 million
Recommended Programs	$ 1.0 million	$ 2.0 million
Total Funding Requirements	**$ 71.2 million**	**$111.1 million**

11.8 Conclusions

Based on a review of available information about existing transportation-related funding sources and needs in the Missoula urban area, it was concluded that there will be sufficient funding available to meet the requirements of the transportation system over the next 20 years, with the exception of funds for transit. This exception is due to legislated restrictions on transit funding.

The projected 20-year needs shown in **TABLE 11-4** do not include the cost of 15 additional recommended major improvements. These projects were not included due to budget limitations. If available funding surpasses the anticipated levels, it is recommended that some or all of these projects be implemented. The financial projections rely on the assumption that current levels of Federal funding for transportation programs continue beyond the time period authorized by ISTEA. Any reduction in Federal funding due to new legislation in 1997 would have significant impacts on the financial picture for Missoula's transportation system.

During the public hearings for this Plan, the community made it clear that they want increased transit service. The obstacle to implementing this is a State law which limits property taxes that can be levied for transit purposes. In order to increase transit funding in Missoula this law would have to be modified.

11.8.1 Financing the Maintenance of the Transportation System

The maintenance of the road network and the other elements of the transportation system is a major undertaking that will cost millions of dollars over the next 20 years. Road maintenance in particular is essential to the overall effectiveness of the transportation system. The majority of road maintenance financing is traditionally derived from gas tax revenues. In theory the gas tax revenue will keep pace with road maintenance, and as traffic grows so will the amount of gas taxes. Unfortunately, this theory is not holding up in light of rising road maintenance costs.

This Plan recognizes that these funds are not keeping pace with the cost of road maintenance and will therefore result in diminished quality of roads if new sources of revenue are not developed. Gas tax rates should be adjusted to keep pace with rising maintenance costs. City and County road funds are currently stretched to the limit and will be stretched further by new roads needed to support new developments. The roads that directly serve new developments should be maintained by the developments, and development impact fees should be imposed to pay for the costs associated with additional traffic loading on the existing road system.

Chapter 12: Recommended Improvement Plan

12.0 Recommended Improvement Plan

This Plan includes a variety of recommended improvement projects and programs. Life cycle costs were considered when evaluating the various alternatives considered for inclusion as a recommended improvement in this Plan. The resulting combination of improvement projects represents the most cost effective means of meeting the overall transportation needs of the greater Missoula. This chapter includes a summary of these recommended improvement projects.

12.1 Recommended Projects

The recommended improvement projects have been sorted into four groups including Committed Improvements projects, CMAQ Improvement projects, Major Improvement projects, and Transportation System Management (TSM) projects. Each project has been identified as having significant pedestrian/bicycle (PB) elements or significant road (Rd) elements. The estimated cost of each project is also presented and broken down according to the estimated dollar amount to be spent on ped/bike improvements and road improvements. Costs associated with projects that improve the transit system are listed as "other costs."

12.1.1 Committed Major Network Improvement Projects

A Committed Major Network Improvement is defined as any transportation project that has been approved and committed to by the Missoula TPCC. The Committed projects are listed in **TABLE 12-1.** Note that 94.2% of the funds associated with the Committed Improvement projects will go toward road-related improvements, with 3.6% of the funds going toward ped/bike-related improvements, and 2.2% going toward other types of improvements. The Committed projects are not listed in any particular order. These committed projects are expected to be implemented as soon as practical. All of these projects are expected to be implemented before the year 2005. A full description of each project is presented in Appendix B of this document.

TABLE 12-1
Committed Major Network Improvement Projects

Values expressed in estimated thousands

PB	Rd	#	LOCATION	DESCRIPTION	Ped/Bike Costs	Road Costs	Other Costs	Total Costs
	X	1	N. Reserve St.	Widen	$0	$18,124	$0	$18,124
X		2	Reserve St.	Landscaping & Ped/Bike improvements	$43	$0	$197	$240 (Done)

PB	Rd	#	LOCATION	DESCRIPTION	Ped/Bike Costs	Road Costs	Other Costs	Total Costs
	X	3	Airport	Interchange	$0	$9,546	$0	$9,546
		4	Fort Missoula	Trolley Car Restoration	$0	$0	$100	$100
X		5	Shady Grove Trail	City-CTEP- Burton to Russell	$102	$0	$0	$102 (Done)
	X	6	S.14th St. W./ Johnson St.	Signal	$0	$120	$0	$120 (In Progress)
X	X	7	SW Higgins-Russell to High Park	Widen	$45	$35	$0	$80
		8	Mullan Road	Irrigation Ditch	$0	$0	$140	$140 (Done)
	X	9	Mullan Road-Old Milwaukee "S" Curves	Reconstruct & Realign	$0	$65	$0	$65 (In Progress)
	X	10	Blue Mtn. Rd.	Realign, Widen & Pave	$0	$750	$0	$750
	X	11	US 93-Glacier & Ridgeway Rds	Realign, Elim. Offset & Signalize	$0	$300	$0	$300
	X	12	Upper Rattlesnake/ E. Missoula Sts.	Paving	$0	$625	$0	$625
		13	Boulevard/Park Trees	City-CTEP-Blvd. Tree Replacement	$0	$0	$38	$38
X		14	E.Front/Madison /Van Buren	City-CTEP-Ped. Improvements	$25	$0	$0	$25
X		15	W. Broadway Sidewalks	City-CTEP- Front to Russell	$324	$0	$0	$324
X		16	City Park	City-CTEP-Sidewalk	$174	$0	$0	$174
X		17	Miscellaneous Locations	City-CTEP-Curb Ramps/Alley Sidewalks	$58	$0	$0	$58
		18	Historic Trail Markers/Display	City-CTEP	$0	$0	$38	$38

PB	Rd	#	LOCATION	DESCRIPTION	Ped/Bike Costs	Road Costs	Other Costs	Total Costs
X		19	Milwaukee RR Right of Way Acquisition	City-CTEP	$ 232	$0	$0	$232 (Done)
X		20	Trail Develop.	City-CTEP	$ 115	$0	$0	$115
X		21	Broadway Riverfront Acquisition	City-CTEP	$ 64	$0	$0	$64 (In Progress)
		22	Stephens Ave.	City-CTEP-Street Right of Way Trees	$0	$0	$193	$193
	X	23	W. Broadway-Airport to Flynn	Widen to 4 Lanes	$ 0	$1,000	$0	$1,000
			TOTAL		**$1,182**	**$30,565**	**$706**	**$32,453**
					3.6%	94.2%	2.2%	

12.1.2 CMAQ Improvement Projects

Projects listed in **TABLE 12-2** qualify for funding through the Federal Congestion Mitigation and Air Quality (CMAQ) Improvement Program. The CMAQ projects are listed in the order of implementation priority. Approximately 49.3% of the CMAQ funds will go toward road-related improvements, 34.2% toward ped/bike-related improvements, and 16.5% toward other types of improvements, which includes all transit improvements. A full description of each project is presented in Appendix B of this document. Note that project #13 (South/Brooks/Russell - Phase 1) is the cutoff for CMAQ funding through FFY97. The remaining CMAQ projects on the list will be funded through future Federal CMAQ funding programs that are anticipated to occur between now and the year 2015.

TABLE 12-2
CMAQ Improvement Projects*

Values expressed in estimated thousands

PB	Rd	#	LOCATION	DESCRIPTION	Ped/Bike Costs	Road Costs	Other Costs	Total Costs
			City Street Paving	In Progress	$500	$1,600	$0	$2,100
			County St. & Alley Paving	Done	$0	$1,453	$0	$1,453

PB	Rd	#	LOCATION	DESCRIPTION	Ped/Bike Costs	Road Costs	Other Costs	Total Costs
			Purchase St. Sweepers	Done	$0	$0	$1,810	$1,810
			Mtn. Line Bus Acquisition	Done	$0	$0	$978	$978
			Mtn. Line-Transit Projects	Done	$0	$0	$0	$0
X			Reserve St. Walkway	Done	$43	$0	$0	$43
			Mountain Line Bus Bike Racks(10)	Done	$10	$0	$0	$10
			Mountain Line Bus Replacement (8)	Done				
X		1	Bike/Ped Coord.	Program Supplement	$24/year	$0	$0	$24/year
	X	2	Areawide	Traffic Signal Project	$0	$4,920	$0	$4,920 (In Progress)
X		3	N. Reserve St.	Transit/Bike/Ped Project	$5,200	$0	$0	$5,200
		4	Mountain Line	Downtown Circulator Bus & Op. Assistance	$0	$0	$460	$460 (In Progress)
		5	Mountain Line	Upgrade: Replace 10 Buses	$0	$0	$45	$45
		6	Mountain Line	Off-Street Transit Facility	$0	$0	$500	$500
X		7	Areawide	Primary Sidewalk Network	$3,100	$0	$0	$3,100
X		8	Areawide	Bicycle Commuter Network	$622	$0	$0	$622
X		9	Areawide	Bicycle Lanes	$325	$0	$0	$325
X		10	North Side	Bike/Ped Access I	$1,200	$0	$0	$1,200
X		11	California St.	Bridge	$600	$0	$0	$600
	X	12	Orange St.	Bridge	$477	$4,298	$0	$4,775

PB	Rd	#	LOCATION	DESCRIPTION	Ped/Bike Costs	Road Costs	Other Costs	Total Costs
	X	13	Brooks/South/ Russell-Phase I	Traffic Improvement	$0	$1,700	$0	$1,700
	X	14	Brooks/South/ Russell-Phase II	Traffic Improvement	$0	$5,500	$0	$5,500
X		15	North Side	Ped/Bike Access II	$1,200	$0	$0	$1,200
X		16	South Ave.- Reserve to 38th	Walkway/Bikeway	$262	$0	$0	$262
		17	Mountain Line	Park & Ride Lots	$0	$0	$685	$685
		18	System-wide	Transit Projects	$0	$0	$2,000	$2,000
			TOTAL		**$13,520**	**$19,471**	**$6,521**	**$39,512**
					34.2%	49.3%	16.5%	

*Projects 1 thru 13 will be funded by the current CMAQ allocations. Projects 14 thru 18 will be funded by future CMAQ allocations.

12.1.3 Other Major Network Improvement Projects

In addition to the Committed and CMAQ projects there are other Major Network Improvement projects that are recommended to meet the needs of the future. Twenty-two projects have been prioritized in order of implementation and are presented in **TABLE 12-3.** The combined cost for these projects is about $36.4 million. Approximately 73.1% of the funds used for the Other Major Network improvements will go toward road-related improvements, 26.6% will go toward ped/bike-related improvements, and 0.2% will go toward other types of improvements. Because of budget limitations, not all of the Major Improvement projects could be financed during the next 20 years. Major Projects that were considered but not funded in this Plan Update are listed in **TABLE 12-4**. A full description of each project is presented in Appendix B of this document.

TABLE 12-3
Other Major Network Improvement Projects

Values expressed in estimated thousands

PB	Rd	#	LOCATION	DESCRIPTION	Ped/Bike Costs	Road Costs	Other Costs	Total Costs
X	X	1	S. 3rd St.- Reserve to Russell	Reconstruct 3 Lanes	$468	$2,032	$0	$2,500

PB	Rd	#	LOCATION	DESCRIPTION	Ped/Bike Costs	Road Costs	Other Costs	Total Costs
X	X	2	Russell St.- River to 3rd	Widen to 5 Lanes	$248	$1,252	$0	$1,500
X	X	3	Russell St. Bridge	5 Lane Bridge Plus Approaches	$1,080	$3,920	$0	$5,000
X	X	4	Airport/Mullan Street Grid	Construct N/S & E/W Collector Streets	$1,200	$3,000	$0	$4,200
X		5	Misc. Ped/Bike Improvements	Project to be Defined Later	$2,000	$0	$100	$2,100
X	X	6	Mullan Rd.- Reserve to Broadway	Overlay and Pave Shoulders	$143	$157	$0	$300
X	X	7	Madison St. River Bridge- South App.	Extend South Along Arthur to 6th	$72	$518	$0	$590
X	X	8	Russell St.-5th to Mount	R/W & Widen to 5 Lanes	$297	$3,703	$0	$4,000
	X	9	Mullan Rd.-First ½ mile W. of Reserve	Widen	$0	$250	$0	$250
X		10	North Side Greenway	Nonmotorized Trail	$293	$0	$0	$293
X		11	S. Reserve-3rd to 39th	Improve Ped/Bike Environment	$500	$0	$0	$500
	X	12	Johnson St. Extension	2 Lanes South to Brooks	$0	$750	$0	$750
X		13	Broadway-Flynn to Bitterroot RR	Install Lighting	$695	$0	$0	$695
X		14	Stephens-Orange to Mount	Install Landscaped Median	$400	$0	$0	$400
X	X	15	Higgins-Pattee Canyon-South*	Reconstruct to 3 Lanes	$243	$1,177	$0	$1,420
X	X	16	Higgins-South to Brooks**	Bike Lanes & Intersection Improvement	$47	$619	$0	$666

PB	Rd	#	LOCATION	DESCRIPTION	Ped/Bike Costs	Road Costs	Other Costs	Total Costs
X	X	17	South Ave.-Reserve to Russell	Reconstruct to 3 Lanes	$468	$3,532	$0	$4,000
X	X	18	39th St./SW Higgins-93 to Pattee	3 Lanes (except 5 lanes Russell-Bancroft)	$1,152	$4,648	$0	$5,800
X	X	19	Mary St. Extension	2 Lanes-Reserve to Mall w/ RR Xing	$48	$202	$0	$250
X	X	20	Rattlesnake Dr.-Lolo to Creek Crossing	Add Paved Shoulders w/ Left Turn Bays at School & Brooks	$162	$338	$0	$500
X		21	South Hills	Nonmotorized Trail	$161	$0	$0	$161
	X	22	Lolo St.-Duncan to Rattlesnake	Reconstruct 2 Lane	$0	$500	$0	$500
			TOTAL		**$9,677**	**$26,598**	**$100**	**$36,375**
					26.6%	73.1%	0.2%	

* Project includes redesign of Higgins/Pattee Canyon intersection

** Project includes redesign of Higgins/Beckwith intersection

TABLE 12-4
Other Major Network Improvements Considered but Not Funded

Values expressed in estimated thousands

PB	Rd	#	LOCATION	DESCRIPTION	Total Costs
X		1	Brooks-Dixon to Buck House Bridge	Lighting	$334
X		2	Misc. Street Lighting Projects	To Be Defined	$2,000
X		3	Stephens-Orange to Brooks	Lighting	$242
	X	4	Linda Vista Bridge (east)	2 Lane Bridge	$2,500
	X	5	Rattlesnake Dr.- Missoula to Lolo	Widen to 3 Lanes	$500
	X	6	Brooks-Mount to Higgins	Widen w/o Cutting Trees	$1,800
	X	7	Van Buren-Vine to Missoula Ave.	Reconstruct 2 Lane w/ Median	$1,500

PB	Rd	#	LOCATION	DESCRIPTION	Total Costs
X	X	8	Greenough/Duncan-Madison to Lolo	Overlay & Realign w/ Sidewalk on One Side	$500
X		9	Creek Crossing	Pedestrian Bridge	$456
	X	10	Maclay Bridge	New 2 Lane Bridge	$3,800
X	X	11	Rattlesnake-Creek Crossing to Tamarack	Pave Shoulders	$167
X	X	12	Duncan Dr.-Lolo St. to W. Mtn. View	Overlay, Add Sidewalk & Blvds	$202
X	X	13	Orange-Alder to I-90	Widen (Incl. New RR Underpass)	$5,100
	X	14	Pattee Canyon Road	Install Wrngs, Clear, Widen Shlds	$193
	X	15	Stephens-South to Pattee Creek	Link Addition	$500
			TOTAL		**$19,794**

12.1.4 Transportation System Management (TSM) Improvement Projects

Transportation System Management (TSM) projects are relatively low cost tune-up type improvements. All but one of the 38 TSM projects contained in **TABLE 12-5** will cost less than $100,000 and all of the TSM projects combined cost about $639,000. Because of the relative low cost of these projects it is recommended that they be implemented as soon as it is practical. The TSM projects are not listed in any particular order. A full description of each project is presented in Appendix B of this document. Approximately 28.4% of the funds spent on these TSM projects will go toward road improvements, while 71.6% of the funds will go toward ped/bike-related improvements.

TABLE 12-5
Transportation System Management (TSM) Improvement Projects

Actual Values Expressed

PB	Rd	#	LOCATION	DESCRIPTION	Ped/Bike Costs	Road Costs	Other Costs	Total Costs
	X	1	Mullan Road MP 2.9-3.1	Install Curve Warnings	$0	$2,600	$0	$2,600
	X	2	Mullan Road MP 2.0-2.2	Install Curve Warnings	$0	$750	$0	$750
	X	3	Mullan Road MP 0.9-1.1	Install Curve Warnings	$0	$860	$0	$860

PB	Rd	#	LOCATION	DESCRIPTION	Ped/Bike Costs	Road Costs	Other Costs	Total Costs
	X	4	Front & Ryman	Restrict Parking	$0	$550	$0	$550
	X	5	Greenough Hill	Straighten Alignment, Enforce Speed Limit	$0	$4,800	$0	$4,800
X		6	Front & Madison	Modify Medians to Enable Bike Xings	$2,400	$0	$0	$2,400
	X	7	Broadway ½ Block East of Van Buren St.	Install Lighting to Illuminate Median	$0	$15,400	$0	$15,400
	X	8	E. Broadway & I-90	Install Curve Warning & Object Markers	$0	$3,900	$0	$3,900
	X	9	I-90-E. Missoula Interchange	Reconstruct WB On-Ramp	$0	$19,000	$0	$19,000
	X	10	S. 3rd & Clements	Flatten Shoulder Slope, Improve Visibility	$0	$17,400	$0	$17,400
	X	11	S. 3rd & Tower	Extend Culvert, Enclose Ditch, etc.	$0	$21,400	$0	$21,400
X	X	12	Higgins-4th to Brooks	Restrict Parking	$1,600	$1,000	$0	$2,600
	X	13	Mount/Park/Franklin/Plymouth	Reconstruct as "Y" Intersection	$0	$15,300	$0	$15,300
	X	14	South Ave. & Johnson	Widen Approaches from N & W	$0	$23,000	$0	$23,000
	X	15	Brooks & Harve	Restrict Parking on North Side of Harve	$0	$225	$0	$225
	X	16	Reserve & 39th	Add Eastbound Left Turn Bay on 39th	$0	$8,000	$0	$8,000
X		17	23rd Avenue	Ped/Bike Improvements	$300,000	$0	$0	$300,000
X		18	Hillview Way	Require Sidewalks/ Bike Lanes				N/A

PB	Rd	#	LOCATION	DESCRIPTION	Ped/Bike Costs	Road Costs	Other Costs	Total Costs
X		19	Madison Street River Bridge-South Approach	Construct Ped/Bike Trail Along Approach	$25,000	$0	$0	$25,000
	X	20	Dearborn & Garfield	Improve Sight Distance	$0	$3,771	$0	$3,771
	X	21	Fairview & Garfield	Improve Sight Distance	$0	$4,920	$0	$4,920
	X	22	Florence & Edith	Install Stops on Edith, Improve Crosswalks if Warranted	$0	$4,750	$0	$4,750
	X	23	Garfield & 9th	Install Stops on 9th, Yellow Curbs	$0	$595	$0	$595
	X	24	Cooley & Dickens	Restrict Parking, Re-Stripe, Larger Stops	$0	$900	$0	$900
	X	25	Garfield & 4th	Install Stop Signs on 4th, Restrict Parking	$0	$595	$0	$596
	X	26	Fairview & Washburn	Extend Curb, Restrict Parking, Larger Stops	$0	$1,155	$0	$1,155
	X	27	Chestnut & 3rd	Larger Stops, Restrict Parking	$0	$880	$0	$880
X		28	Front & Pattee	Install Sidewalk Bulbs, Signs & Pavement Markings	$8,900	$0	$0	$8,900
X		29	Main & Ryman	Install Sidewalk Bulbs, Signs & Pavement Markings	$10,900	$0	$0	$10,900
X	X	30	Cottonwood & 3rd	Westbound Left Turn Bay, Ped Xing on 3rd, Move Signs	$875	$3,910	$0	$4,785 (Done)
	X	31	Cottonwood & 6th	Move Signs, Add Signs & Pavement Markings	$0	$1,021	$0	$1,021
	X	32	Mount & Cleveland	Limit Access, Restrict Turns	$0	$1,590	$0	$1,590

PB	Rd	#	LOCATION	DESCRIPTION	Ped/Bike Costs	Road Costs	Other Costs	Total Costs
X		33	Kent & Oxford	Install Islands, Stop Bars, Ped Xings	$7,725	$0	$0	$7,725
X		34	Myrtle & 4th	Install Curb Bulb & Sidewalk Island	$6,670	$0	$0	$6,670
	X	35	Phillips & Cowper	Larger Stop Signs, Restrict Parking	$0	$1,200	$0	$1,200
	X	36	Arthur & Beckwith	Replace Signal Heads, Add Turn Lanes	$0	$21,990	$0	$21,990
X		37	Spruce & McCormick	Move Curb Line, Reconstruct Sidewalks	$7,845	$0	$0	$7,845
X		38	Liberty & Riverfront	Nonmotorized Trail	$85,500	$0	$0	$85,500
			TOTAL		**$457,415**	**$181,462**	**$0**	**$638,877**
					71.6%	*28.4%*	*0%*	

12.2 Recommended Programs

In addition to the numerous improvement projects listed in the previous section, the Plan includes a wide variety of recommended programs. These programs fall into several groups, including bicycle, pedestrian, transit, and Transportation Demand Management programs. A total of $2 million over the next 20 years is allocated toward the programs listed in this section.

Bicycle Programs

There are 30 bicycle program recommendations listed in Chapter 3 of this document. These recommendations range from development of a complete bikeway system to implementation of comprehensive programs for bicycle safety education and enforcement of bicycle traffic laws.

Pedestrian Programs

Chapter 4 lists 16 recommended pedestrian programs. Included in this list are community policy recommendations as well as systemic improvements to physical facilities.

Transit Programs

Chapter 5 lists numerous transit program recommendations for the Mountain Line system as well as alternative transit programs. Program recommendations for the Mountain Line system include periodic evaluation for route expansion, promotional events, education, and transit-oriented community development guidelines. Alternative transit recommendations include promotion of telecommunications, altered work schedules, and ride sharing.

TDM Programs

Numerous TDM strategies, ranging from voluntary to mandatory, were evaluated in Chapter 10 and Appendices E and F of this document. For the first decade of this Transportation Plan, strictly voluntary programs are recommended for implementation. More information is available in Chapter 10.

12.3 Prioritized Implementation Strategy

The projects listed in this chapter vary significantly with respect to the type of improvement, cost, funding source, and ease of implementation. Because of these variables it is necessary to provide some structure to prioritizing the implementation of the projects. For purposes of the air quality determination, it is also necessary to identify which projects would be completed by the year 2005.

Because of the nature of the projects and the various funding sources, it is not prudent to establish a set order of implementation for all of the projects and expect to be able to hold to a rigid schedule. It is likely that many projects will be planned and developed within the same general time frame. As a result, projects have been divided into two categories: 1) projects that will be implemented before the year 2005, and 2) projects that will be implemented between 2005 and 2015. **TABLE 12-6** indicates which projects are expected to be completed by the year 2005. Projects not included in this table are expected to be completed during the following decade.

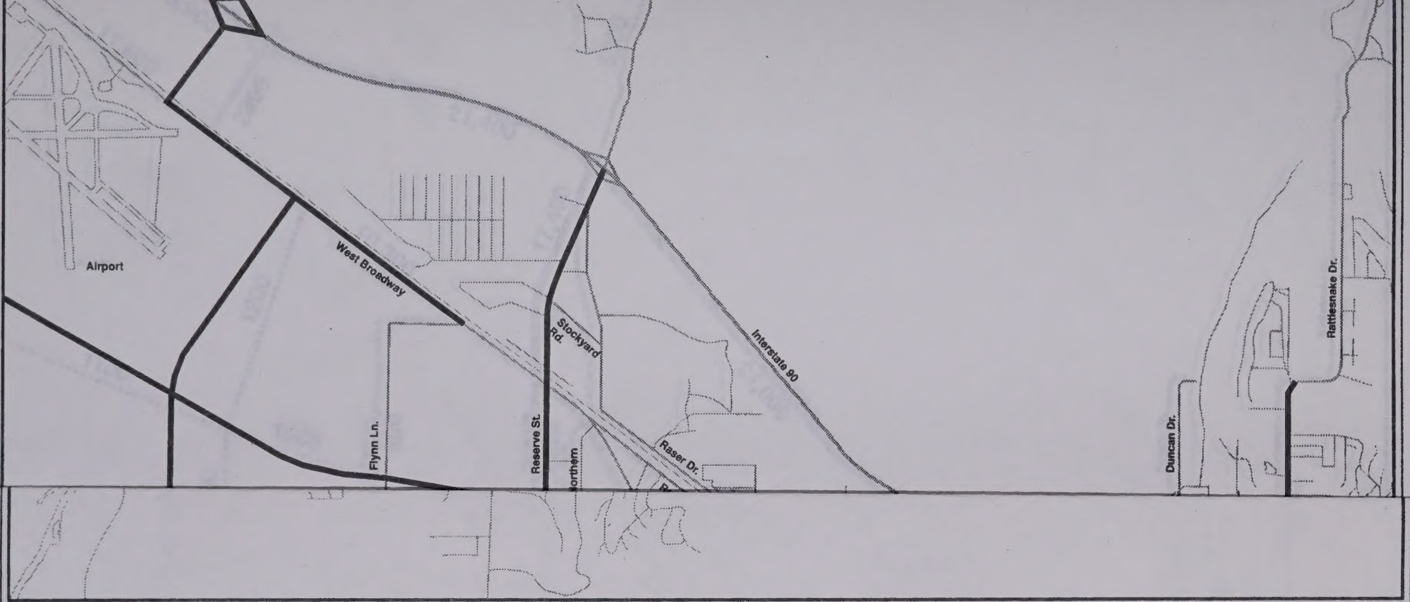
TABLE 12-6
Year 2005 Project Summary

Project Type	Projects to be Completed by 2005	Estimated Cost
Committed Projects	All 23 projects listed in TABLE 12-1	$32,453,000
CMAQ Projects	Projects 1-13 listed in TABLE 12-2	$21,778,000
Other Major Projects	Projects 1-5 listed in TABLE 12-3	$15,300,000
TSM Projects	All 38 projects listed in TABLE 12-5	$638,877
Programs	First half of all programs in Section 12.2	$1,000,000

The projects that are expected to be completed by the year 2005 are estimated to cost a total of approximately $71.2M. It is estimated that available funds during this same period of time will amount to approximately $74.2M (see Chapter 11).

12.4 Recommended Major Street Network

Implementation of this Transportation Plan will result in changes to the major street network. The sections of the network that will receive improvements as part of recommendations contained in this Plan are identified in **FIGURE 12-1**. The implementation of all of the recommended improvements will produce a "recommended major street network". The projected traffic volumes for the major street network for the year 2005 are shown in **FIGURE 12-2**. Major transportation improvements which are expected to occur by 2005 include: New I-90 Airport Interchange, Airport/Mullan Street Grid Improvements, Linda Vista Drive Extension, Area-wide Traffic Signal Improvements, Brooks/South/Russell Intersection Improvements, Orange Street Bridge Reconstruction, North Reserve Street Widening, Southwest Higgins Widening (South to Pattee Canyon), South 3rd Street Widening, Russell Street Widening (3rd to River), Russell Street Bridge Widening, and Broadway Widening. **FIGURE 12-3** indicates the projected volumes for 2015, when most of the projects contained in this Plan are expected to be complete.



Proposed Road Improvements

LEGEND

▬	Road Improvement Segment

Map - Not To Scale

N

MISSOULA
THE GARDEN CITY
HUB OF FIVE VALLEYS

MISSOULA
URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996

Figure 12-1
Proposed Road
Improvements

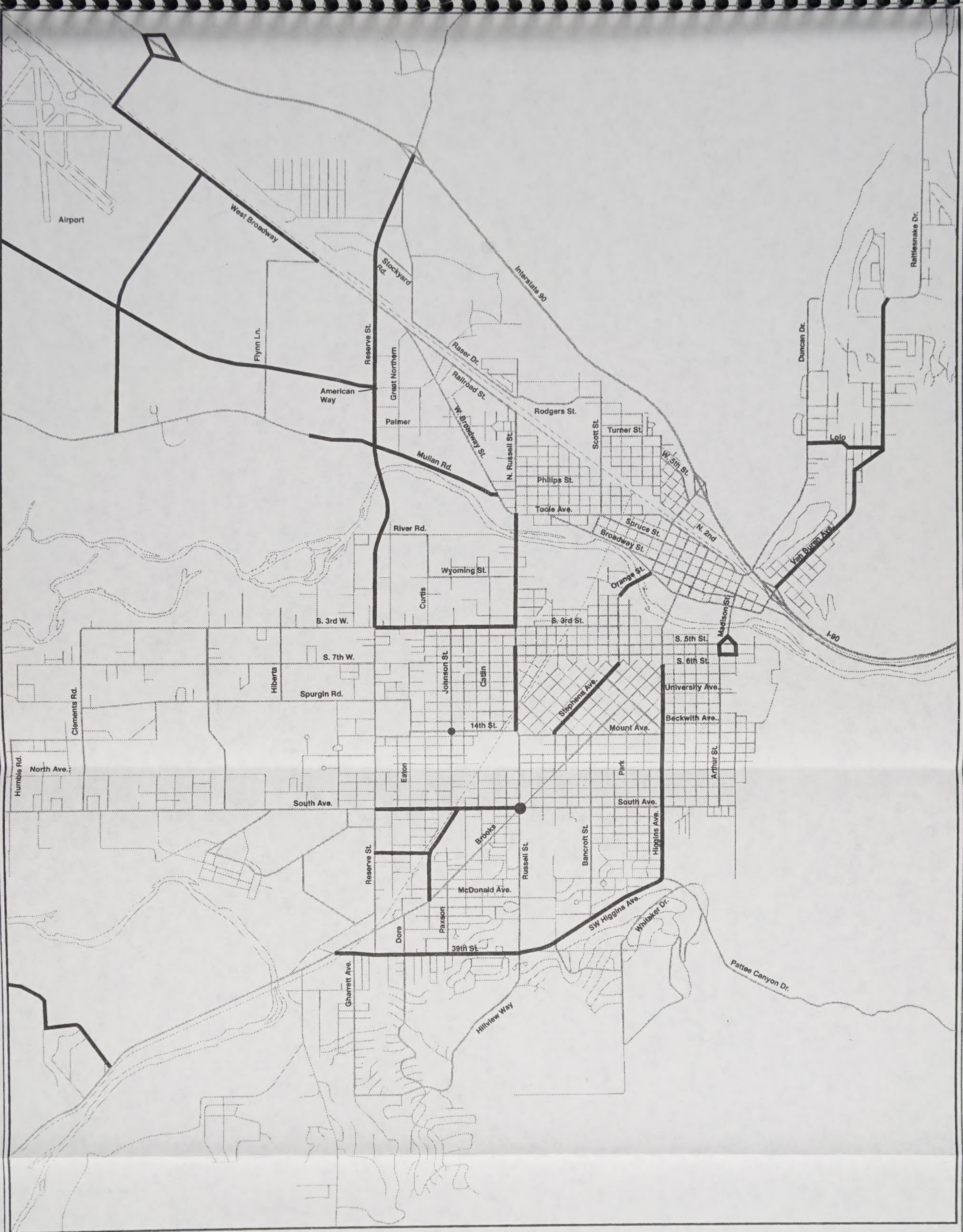


Figure 12-1
Proposed Road
Improvements

Proposed Road Improvements

LEGEND

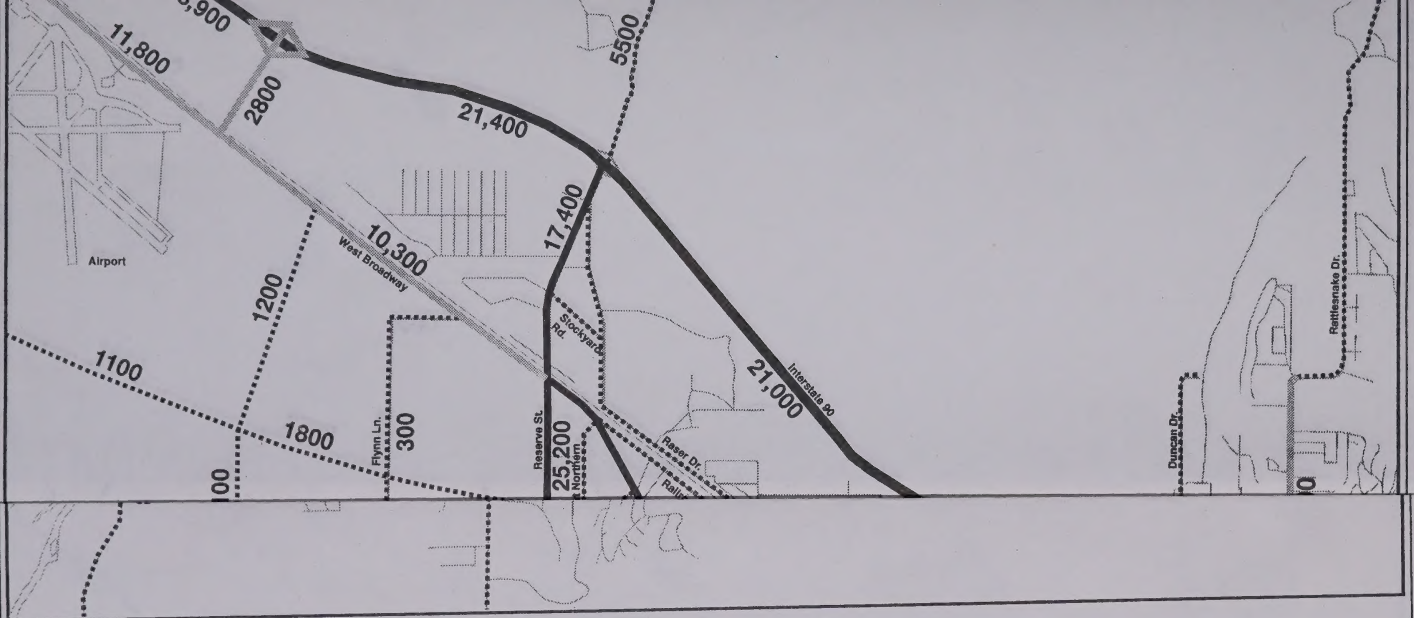
▬ Road Improvement Segment

Map - Not To Scale

N

MISSOULA

MISSOULA
URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996



Projected Traffic Volumes (2005 ADT) with Recommended Improvements

LEGEND

- Interstate
- Principal Arterial
- Arterial
- Collector
- 13,200 Average Daily Traffic Volume

Map - Not To Scale

MISSOULA

MISSOULA
URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996

Figure 12-2
Projected Traffic Volumes
(2005 ADT) with
Recommended Improvements

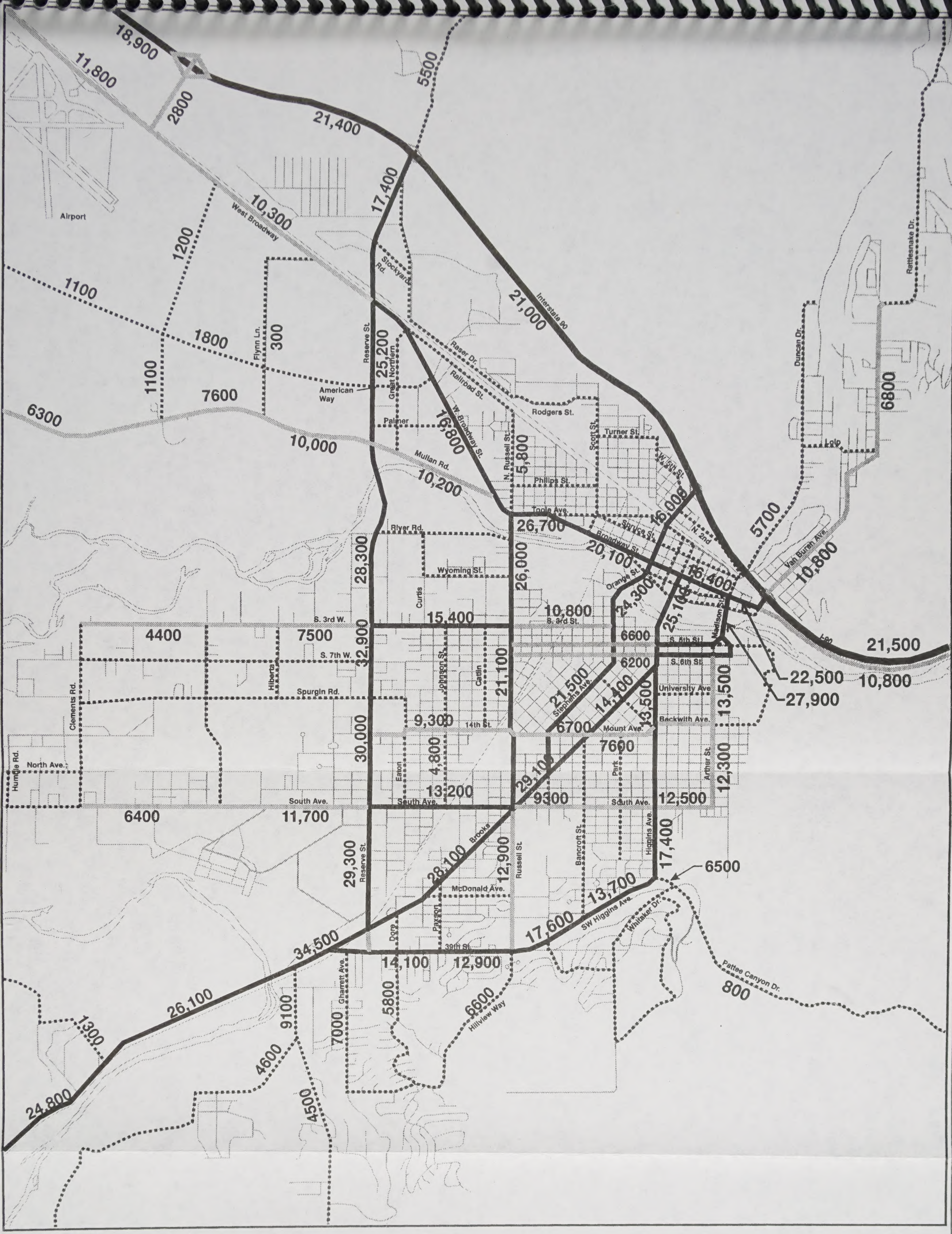


Figure 12-2
Projected Traffic Volumes
(2005 ADT) with
Recommended Improvements

Projected Traffic Volumes (2005 ADT) with Recommended Improvements

LEGEND

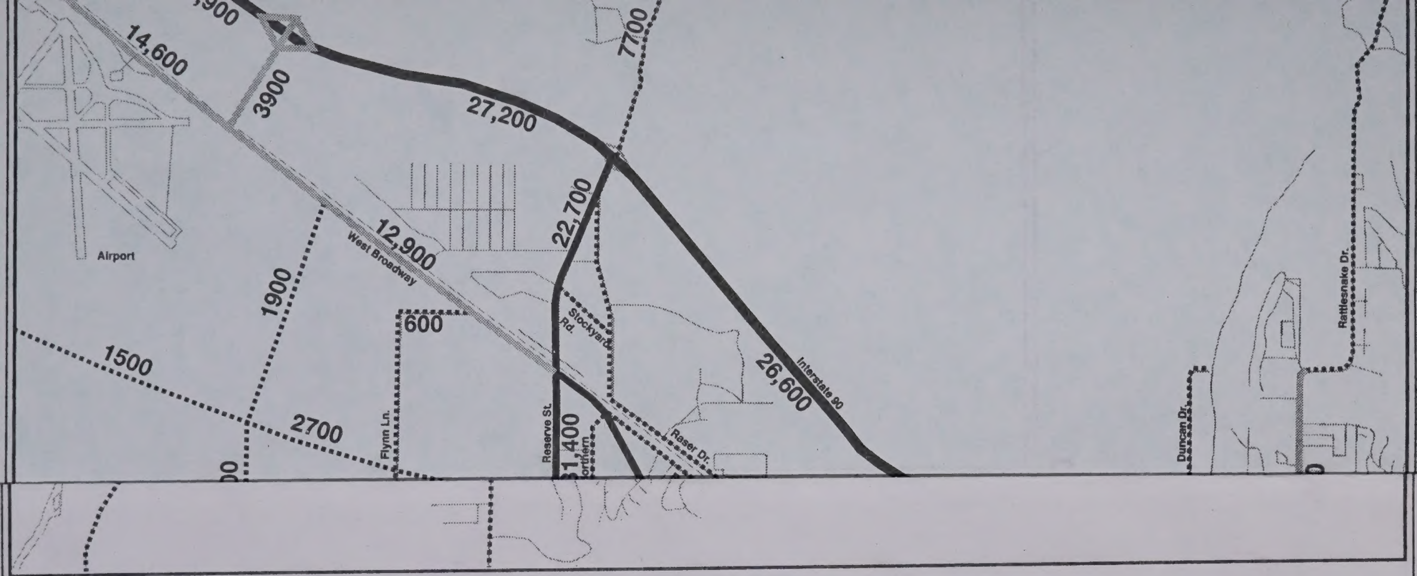
- ▬ Interstate
- ▬ Principal Arterial
- ▬ Arterial
- ┈┈ Collector
- 13,200 Average Daily Traffic Volume

Map - Not To Scale

N

MISSOULA

MISSOULA
URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996



Projected Traffic Volumes (2015 ADT) with All Recommended Improvements

LEGEND

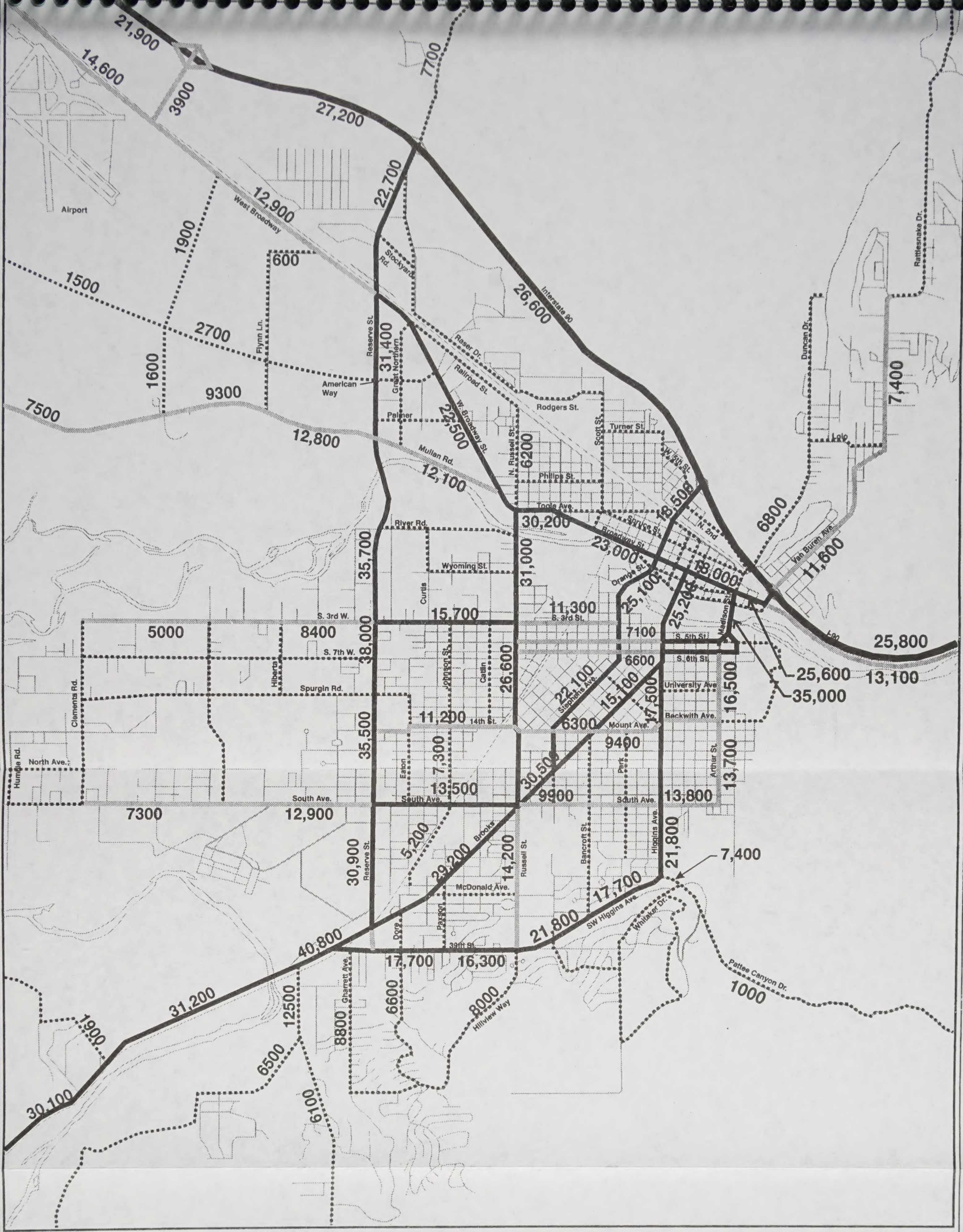
▬ Interstate
▬ Principal Arterial
▨ Arterial
.... Collector
13,200 Average Daily Traffic Volume

Map - Not To Scale

N

MISSOULA
URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996

Figure 12-3
Projected Traffic Volumes
(2015 ADT) with All
Recommended Improvements



Projected Traffic Volumes (2015 ADT) with All Recommended Improvements

LEGEND

- ▬ Interstate
- ▬ Principal Arterial
- ▬ Arterial
- ······· Collector
- 13,200 Average Daily Traffic Volume

Map - Not To Scale

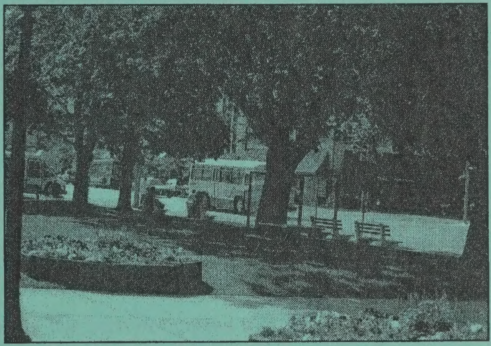
N

MISSOULA

MISSOULA
URBAN AREA TRANSPORTATION
PLAN UPDATE - 1996

Figure 12-3
Projected Traffic Volumes
(2015 ADT) with All
Recommended Improvements

Chapter 13: Air Quality Analysis



13.0 Air Quality Analysis

13.1 Introduction

The Federal Clean Air Act of 1970 established National air quality standards for six pollutants. The Act required states exceeding the standards to prepare air quality plans showing how the standards were to be met by 1987. The Act was amended in 1977, and again in 1990, to extend the deadline for compliance and require that revised State Implementation Plans (SIP) be prepared. The SIP is the strategy by which the air quality standards will eventually be attained.

The 1990 Clean Air Amendments included provisions designed to ensure that federal agencies contribute to, rather than jeopardize, efforts to achieve the air quality standards. In November of 1993, the U. S. Environmental Protection Agency (USEPA) issued regulations implementing the conformity provisions of the 1990 Clean Air Act Amendments. Separate rules were developed for transportation projects/plans (Transportation Conformity Rule) and other federal actions (General Conformity Rule). The purpose of this air quality analysis is to demonstrate that the Missoula Transportation Plan meets the requirements of the Transportation Conformity Rule.

13.2 Background

Based on air pollution monitoring data, Missoula has been designated as “non-attainment” (the standards are not attained) for two pollutants: carbon monoxide and PM_{10}. These two pollutants are quite different, and the official boundaries of the “non-attainment areas” for the two pollutants vary as well. **FIGURES D-1** and **D-2** in Appendix D delineate the “non-attainment areas” for carbon monoxide and PM_{10}.

Carbon Monoxide

Carbon monoxide (CO) is an odorless, colorless gas created by the incomplete combustion of fuels. Its major source in Missoula is automobile exhaust. High concentrations of carbon monoxide in Missoula are a wintertime phenomena. This is because vehicles produce more carbon monoxide as temperature decreases and there is less dispersion of the gas during light wind and inversion conditions that typically occur in winter in Missoula. On calm, clear winter nights, the rapid cooling of the ground after sunset often results in a trapping of pollutants beneath a blanket of warmer air.

Since carbon monoxide’s major source is vehicle exhaust, higher concentrations of this pollutant will be found near major roadways. Since the emission rate from vehicles increases as average speed goes down, the highest concentrations of carbon monoxide will be found near congested intersections. Although CO violations of the air quality standards in Missoula have been found only in the vicinity of the South/Brooks/Russell intersection, the official nonattainment area includes all of Missoula and parts of neighboring urbanized Missoula County.

PM_{10}

PM_{10} is shorthand notation for Particulate Matter of less than 10 microns (one hundred-thousandth of a meter or roughly 0.0004 inches) in diameter. Also known as suspended particulate matter or fine particulate matter, PM_{10} consists of a wide range of solid or liquid particles small enough to remain suspended in the atmosphere. There are many sources of PM_{10}, including combustion, industry, grading and construction, wind erosion of soils, and automobiles. According to the Missoula PM_{10} State Implementation Plan, in 1990 traffic-generated PM_{10} accounted for 49.9% of all PM_{10} pollutants, with the remainder coming from wood burning (44.7%) and industrial sources (4.6%). Of the PM_{10} emissions associated with motor vehicles, some are produced by tailpipes or tire wear, but much greater quantities are generated by resuspension of road dust.

The highest concentrations of PM_{10} measured in the atmosphere of Missoula typically occur in the winter and spring months. Road dust emissions reach a maximum after warming temperatures melt snow and ice on roadways, and the accumulated dust from road sanding dries. The pulverization of sand into fine particulate by passing vehicles continuously replenishes the supply of material that can be entrained into the wakes of passing vehicles.

Unlike carbon monoxide, the production of PM_{10} by automobiles is not greatly affected by temperature, vehicle speed or congestion levels. Instead, the generation of PM_{10} by vehicles is directly determined by traffic volume, the condition of the roadway surface (icy, wet, or dry), and the amount of fine material on the roadway (known as the silt loading).

The official nonattainment area for PM_{10} is slightly smaller than that for carbon monoxide, but also includes the City of Missoula and adjacent portions of urbanized Missoula County.

It is acknowledged that the EPA regulations and standards for PM_{10} pollutants may change in the future. In 1995, the United States Environmental Protection Agency (EPA) issued a staff paper on the particulate matter standard. The findings of that paper were as follows:

- The current health and welfare-based standards for particulate matter (measured as PM_{10}, denoting particles with a nominal size less than 10 micrometers in diameter), were last revised in 1987. The 24 hour PM_{10} standard is 150 micrograms per cubic meter and the annual PM_{10} standard is 50 micrograms per cubic meter.

- Since the standards were last revised, a large number of significant new studies have been published on the health effects of particulate matter. Recent health effects studies suggest that adverse public health effects such as premature deaths and increased morbidity in children and other sensitive populations have been associated with exposure to particle levels well below the existing standard.

- The EPA believes that retaining the current standard while adding a new fine particulate standard will 1) provide better protection against health effects associated with exposure to fine particles, and 2) continue to provide public health and environmental protection for effects associated with coarse particles.

While the proposed standard probably will not be adopted until early 1997, this Plan acknowledges that conformity issues will arise when the new standard is adopted and that appropriate Plan amendments must be made at that time.

13.3 Summary of Findings

TABLES 13-1 and **13-2** summarize the findings of the air quality analysis with respect to each requirement of the Transportation Conformity Rule. The conformity requirements are explained in greater detail in Section D.2 (Appendix D). The methodology used in forecasting future air quality is described in Section D.3 (Appendix D). As shown in the following tables, air quality analysis demonstrates that this Plan meets all conformity criteria for all required analysis years.

TABLE 13-1
Summary of Air Quality Analysis

Emission Pollutant (lbs/day)	**1990**	**1998**	**2005**	**2015**	**2015 Budget**
CO without Recommended Improvements	189,481	68,688	54,074	58,697	N/A*
CO with Recommended Improvements	N/A	68,642	53,816	57,608	N/A*
PM_{10} without Recommended Improvements	11,302	N/A	N/A	N/A	N/A
PM_{10} with Recommended Improvements	N/A	12,159	13,357	15,538	16,119

* There is no CO Budget. Rather, the Plan improvement package is required to have a positive impact on CO levels. In addition, the 1990 CO levels must not be exceeded.

TABLE 13-2
Summary of Air Quality Determination

Pollutant	Required Analysis Year	Criterion	Criterion Met?
PM_{10}	**1998**	Predicted Emissions Below Budget Established in SIP	Yes
	2005		Yes
	2015		Yes
Carbon Monoxide	**2005**	Predicted Emissions Below 1990 Emissions	Yes
	2015		Yes
	2005	Projects Result in a Reduction in Emissions	Yes
	2015		Yes

The air quality analysis found that the recommended projects contained in the Plan will decrease emissions of carbon monoxide in future years by reducing traffic congestion. In terms of future air quality in Missoula, the Transportation Plan will result in carbon monoxide concentrations lower than those of 1990.

The analysis also found that future year emissions of PM_{10} from vehicles will not exceed the established emissions "budget" established in the State Implementation Plan. The Transportation Plan will not interfere with maintenance of the PM_{10} air quality standards through the year 2015.

Chapter 14: Implementation Strategy

14.0 Implementation Strategy

14.1 Initial Considerations

In order to address as many recommendations as possible during the planning period, local government must be creative in securing financing for each project. Traditional sources of funding may disappear during the period or may be altered to such an extent that they no longer meet the needs of the community. The identification of alternative sources of financing that are acceptable to the community at-large, along with creative methods of utilizing traditional funds should be a high priority.

A second requirement local government must have to implement these recommendations is flexibility. The priorities of projects set by local government should be subject to periodic reviews and modification based on existing financial resources, the availability of supplemental funds, changes in community desires, or other considerations for each improvement. Therefore, an ongoing review of recommended transportation improvements is essential.

14.2 Development Strategy for Major Network Improvement Projects

The committed and recommended improvements to the major street network in the Missoula area are outlined in Chapter 12 and discussed in detail in Appendix A. The MPO will have to perform a review of the recommendations and determine the factors by which to prioritize the improvements. For instance, in certain situations financing from public sources may be unavailable for a particular improvement. However, in analyzing such an improvement, it may be determined that a private party would benefit significantly form the project. In such a case, private dollars could possibly be used as a match to secure public funds. Therefore, in considering the prioritization of improvements, it is essential for local government to remain flexible and take advantage of financing opportunities as they arise.

Obviously, the major difficulty in completing almost any major improvement project will be securing financing. The following recommendations present general guidelines for performing financial planning:

☐ A coherent financial plan is necessary. Both the City and the County develop Capital Improvement Plans (CIPs) and Transportation Improvement Plans (TIPs) on a cyclic basis. The CIPs and TIPs are the principal documents that outline the projects to be completed in the immediate future. These plans typically include an analysis of all available sources of financing and link major network improvements to identified sources of financing.

☐ Matching funds can also be a tremendous benefit to the local government. A consideration of matching funds should play a significant role in financial planning, with projects for which matching dollars are available given high priority. Local government should work to develop new sources of matching funds. Consideration should be given to establishing a small reserve fund so that monies would be available as new sources of matching funds are developed.

☐ The financial plan should emphasize that in special cases, private dollars might be available to undertake a project. In such a case, the source of funding must be identified as a direct beneficiary of the project. The local government should bear in mind that such funding could provide the match necessary to receive state or federal funds.

Other considerations relating to financing are important as well. Actively pursuing the advance acquisition of right-of-way needed for projects is a good example. If the property necessary for a low priority improvement becomes available prior to the time local government has scheduled the improvement, consideration should be given to changing the project's priority and purchasing the right-of-way at today's lower costs. The following are additional considerations relating to the right-of-way acquisition:

☐ Local government should focus on key landowners and work to maintain favorable relations with them. In some instances, particularly in situations in which there is a perception that property will be difficult to obtain, local government should attempt to initiate a negotiation process with the landowner as soon as possible.

☐ Local government should not rule out entering into agreements with landowners that may benefit over the long-term. For instance, the local government may be aware of property it will require for future improvement. At present, local government may not have funds available for acquisition, and the landowner may not wish to sell. Nonetheless, by entering into an agreement for right-of-way-refusal, local government can delay expenditures until such a time that it experiences a more favorable financial situation.

☐ Local government should bear in mind that it can exert considerable influence on the development (or lack of there-of) of property which may potentially be required by the community for transportation improvement purposes. The governing body's zoning and condemnation powers should not be overlooked particularly in right-of-way matters.

Finally, in undertaking major network improvements, the local government should be aware of opportunities for constructing projects in separate phases. Often, funding is simply not available to address an improvement in its entirety. In such cases, a great deal can be accomplished by tackling separate components of individual improvements over the long term.

14.3 Transportation System Management (TSM) Strategy

The recommended TSM improvements are listed in Chapter 12 and detailed in Appendix B. The TSM projects have been listed by geographic area but have not been prioritized so local government has maximum flexibility in implementing these improvements. Assigning priority for the recommended TSM projects is further complicated by the fact that the State, Missoula County, and the City of Missoula all maintain jurisdiction over various portions of the major street network where projects are proposed. Therefore, each of these entities may have separate priorities for implementing TSM projects under their respective jurisdictions.

Considerations for setting priorities would include safety, cost of the project, availability or alternate funding, ease of implementation, and neighborhood interest. Implementation of the projects would begin with the highest priority group and continue until all projects in the group are completed.

No aspect of addressing TSM improvements will demand more creativity and flexibility than financing the projects. Local government will be required to be aware of changes in funding sources and of new sources. Local governments should, at all times, be mindful of the following considerations regarding the financing:

☐ Numerous conventional methods of financing improvements are available to the local government (bonds and Special Improvement Districts, for example). Such obvious methods should not be overlooked.

☐ Financing for special types of projects sometimes are available. Currently, funding is available for certain kinds of safety projects and projects for bicycle facilities and walking trails.

☐ Local government should attempt to link private beneficiaries of TSM improvements with private sources of financing. Further, in the event that private individuals come forward with funding, the local government should be prepared to accept it.

☐ Making one person responsible for performing an ongoing review of recommended TSM improvements and seeking out sources of financing may very well be beneficial.

14.4 Program Development Strategy

A wide variety of pedestrian, bicycle, and Transportation Demand Management (TDM) programs are recommended as part of this Plan. A total of $2 million, over the course of the next 20 years, has been allocated towards funding these programs. That amounts to $100,000 per year. It is suggested that a portion of this money be spent on supporting an integrated TDM program. The TDM program should include funding for a TDM Coordinator. Preferably this position would be in addition to the current pedestrian/bicycle coordinator. The remainder of the annual funding should be spent on materials and advertizing for the programs.

The principal strategy for developing the recommended programs involves the above mentioned TDM coordinator. This individual would be responsible for developing and promoting TDM programs and goals. Another responsibility of the TDM coordinator would involve locating private sector sponsors to help provide financial assistance for various programs. The TDM coordinator would work with businesses and individuals, providing them with the appropriate program information and technical support.

14.5 Alternative Financing Strategy

It is recognized that financing transportation improvement projects and programs is a very large problem for the community. Several alternative financing methods should be seriously considered for generating additional funds. One such method is development impact fees for financing new roads and road expansions that are a direct result of new development. General Obligation Bonds should be used to finance special improvements that have community-wide support and that will benefit the majority of the community.

The most likely source of additional funding for transit operations is obtainable only if the State laws pertaining to property taxes are modified. If the people of the community really want more transit service and free transit service, then the law must be changed to allow more tax dollars to be accessible for transit operation. A vote by the general public during the election process is probably the best way to receive a clear indication of community-wide support for this issue.

Implementation of tolls on river bridges and on the entrance roads leading into a community has been very successful in generating revenue for communities in other parts of the United States and in foreign countries. It is acknowledged that tolls are not popular and probably not legal under current State law. On the other hand, tolls are a very effective user fee system of generating large amounts of revenue for transportation improvements.

Appendices:

Appendix A Missoula Election Day Survey Results

An Exit Poll Survey was administered to the public during the elections in November, 1994. Of the 28,555 Missoula voters, 6,132 completed the transportation questionnaire (a 21% response rate). The questionnaires were filled out and incorporated in the survey summary provided in this appendix.

MISSOULA CITIZENS' SURVEY
Tabulation of responses for full sample

MISSOULA AREA TRANSPORTATION ISSUES

1. Which of the following major Missoula area roads do you TRAVEL EVERYDAY or almost everyday?

North-South Roads:
44% Higgins **35%** Brooks **37%** Reserve **34%** Russell **33%** Orange St./Stephens

East-West Roads:
38% South Ave **22%** 3rd St. **39%** 39th St. **39%** Broadway **10%** US Interstate 90

2. Please rate traffic conditions on the Missoula area ROADS YOU TRAVEL REGULARLY.

Conditions Are Good	Neutral/ Undecided	Minor Problems	Serious Problems	No Response	Major Cross-Town Roads
15%	**9%**	**35%**	**34%**	**7%**	Traffic on Major N-S Roads
17%	**13%**	**40%**	**19%**	**11%**	Traffic on Major E-W Roads
					Main Rds Where You Live
22%	**13%**	**34%**	**20%**	**7%**	Traffic on Main N-S Roads
22%	**16%**	**37%**	**12%**	**14%**	Traffic on Main E-W Roads
					Local Sts Where You Live
42%	**11%**	**29%**	**12%**	**7%**	Traffic-Neighborhood
49%	**9%**	**23%**	**11%**	**8%**	Traffic-Street You Live On

3. Using the scale below, please GRADE overall traffic conditions on Missoula area roads you travel regularly.

2% A= Excellent	**21%** B= Good	**48%** C= Fair
24% D= Poor	**9%** E= Very Poor	**4%** No Response

4. In the future (5 years from now), do you expect Missoula's traffic conditions to be:

1% Much Improved	**7%** Improved	**11%** About same
26% A little worse	**52%** Much worse	**4%** No Response

MISSOULA'S TRANSPORTATION PRIORITIES

5. Which of the following actions should be Missoula's priorities for improving local traffic conditions?

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
19%	**17%**	**17%**	**12%**	**26%**	**10%**	Build Overpass/Underpass at Malfunction Junction. (eliminate 6-way intersection)
23%	**26%**	**22%**	**11%**	**9%**	**9%**	Widen/add lanes to major North-South roads to accommodate more traffic.
12%	**19%**	**29%**	**18%**	**11%**	**11%**	Widen/add lanes to major East-West roads to accommodate more traffic.
34%	**27%**	**22%**	**6%**	**4%**	**8%**	Improve coordination & timing of traffic signals to speed up traffic flows.

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
27%	**14%**	**20%**	**18%**	**15%**	**7%**	Encourage more people to Walk instead of driving (repair & build new sidewalks & paths, improve crosswalks & signals).
30%	**14%**	**15%**	**17%**	**18%**	**6%**	Encourage more people to Bicycle instead of driving (expand & enhance Bicycling facilities-add/improve bike paths, bike lanes, & bike parking).
30%	**21%**	**23%**	**12%**	**9%**	**5%**	Increase ridership on Missoula's "Mountain Line" Bus Service - add buses, routes, bus stops, operate more hours.
25%	**20%**	**26%**	**14%**	**9%**	**6%**	Encourage more people to carpool to work and school (citizens, local governments, the University, & area businesses would publicize and help organize carpools).
11%	**19%**	**23%**	**23%**	**17%**	**6%**	Widen traffic lanes & improve flows by Reducing Parking along major streets.
22%	**25%**	**23%**	**12%**	**9%**	**11%**	Move drive-through truck traffic from Reserve St. to Truck Route located to West of Airport (north-south trucks would be routed outside of urban area).

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
20%	**23%**	**23%**	**12%**	**13%**	**10%**	Relocate US Highway 93 from Reserve St. to West of Airport (most drive-through auto and truck traffic would be routed outside of urban area).
24%	**15%**	**19%**	**17%**	**18%**	**7%**	Require Large Employers to develop programs encouraging workers to carpool, ride buses, walk, and bike to jobs instead of driving separate vehicles.

MISSOULA TRANSPORTATION ALTERNATIVES

6. If Missoula substantially improves the CONVENIENCE and RELIABILITY of LOCAL BUS SERVICE, how often will you RIDE THE BUS INSTEAD OF DRIVING? (Bus stops would be located within two blocks of where you live, work, and attend classes).

4-5 or more days a week	2-3 day a week	1 day a week	1-2 days a month	Once every few months	Never	No Response
12%	**19%**	**9%**	**8%**	**14%**	**31%**	**7%**

7. If substantial improvements are made to BICYCLE LANES LOCATED ALONG MISSOULA ROADS, how often will you BICYCLE INSTEAD OF DRIVING (weather permitting)? Bike lanes would be clearly identified by roadside signs and on-pavement markings.

4-5 or more days a week	2-3 day a week	1 day a week	1-2 days a month	Once every few months	Never	No Response
21%	**16%**	**7%**	**6%**	**9%**	**35%**	**6%**

8. If Missoula develops an extensive network of BICYCLE PATHS SEPARATED FROM ROADS, how often will you BICYCLE INSTEAD OF DRIVING (weather permitting)? Bike paths would be located along old railroad and open space corridors, and parklands.

4-5 or more days a week	2-3 day a week	1 day a week	1-2 days a month	Once every few months	Never	No Response
26%	**16%**	**5%**	**6%**	**8%**	**33%**	**6%**

9. If Missoula constructs new sidewalks and repairs existing sidewalks in residential and business areas, how often will you WALK INSTEAD OF DRIVING (weather permitting)? Safe crosswalk areas would be provided at major street crossings.

4-5 or more days a week	2-3 day a week	1 day a week	1-2 days a month	Once every few months	Never	No Response
14%	**19%**	**10%**	**11%**	**11%**	**28%**	**7%**

10a. If a CARPOOL or vanpool is formed near your home, how often WILL YOU CARPOOL to work or school?

4-5 or more days a week	2-3 day a week	1 day a week	1-2 days a month	Once every few months	Never	No Response
9%	**6%**	**6%**	**6%**	**7%**	**50%**	**11%**

10b. If Missoula develops a program to help start carpools, WILL YOU PARTICIPATE by providing your address and travel times to transportation staff? (A computer would be used to match people with very similar travel patterns. Staff also would help to organize the carpools.)

Yes, Definitely	Probably	Undecided	No	I would rather organize a carpool myself	No Response
11%	**15%**	**17%**	**39%**	**9%**	**10%**

DRIVING IN MISSOULA

11. How often (if ever) do you intentionally drive on side streets to avoid traffic congestion on major roads?

Everyday/ almost everyday	A few times a week	A few times a month	Never	No Response
39%	**31%**	**17%**	**8%**	**6%**

12a. Are you able to change your travel characteristics during AIR ALERT DAYS? (Altering travel to cause less air pollution.)

YES (I am always able to change my travel characteristics)	SOMETIMES (I am sometimes able to change my travel characteristics)	NO	No Response
13%	**38%**	**42%**	**7%**

12b. If you are able to change your travel during AIR ALERT DAYS, what do you do? (CHECK ALL RESPONSES THAT APPLY.)

39%	I drive my car less
3%	I carpool
8%	I ride the bus
10%	I walk
10%	I bicycle
32%	No Response

OPTIONAL QUESTIONS

1. Are you:

Employed Outside Your Home	Employed Inside Your Home	Retired	Homemaker	University Student	Other Student	Between Jobs	No Response
63%	**8%**	**12%**	**7%**	**8%**	**0%**	**1%**	**6%**

2. During a typical week (use October as example) how do you travel to work/school?

I Drive Alone	I Carpool	I Ride the Bus	I Walk	I Bicycle	N/A	No Response	
55%	**4%**	**2%**	**6%**	**10%**	**10%**	**13%**	a) the way I travel to work/school Most of the Time.
19%	**6%**	**4%**	**10%**	**11%**	**23%**	**17%**	b) Other Ways I sometimes travel to work.

3. About HOW FAR do you live from where you work? (OR, if you are a student- How far do you live from school)?

4% 0 miles (work at home)
9% 1 mile or less
13% 1.1 to 2 miles
14% 2.1 to 3 miles
17% 3.1 to 5 miles
12% 5.1 to 10 miles
4% 10.1 to 15 miles
2% 15.1 to 20 miles
0% 20.1 to 30 miles
0% 30.1 to 40 miles
0% More than 40 miles
0% No Response

4. What age group are you in:

10% 18-24
19% 25-34
26% 35-44
21% 45-54
10% 55-64
9% 65 and older
6% No Response

5. About how many years have you lived in the Missoula area?

Median = 15 years

MISSOULA CITIZENS' SURVEY
MISSOULA AREA TRANSPORTATION ISSUES

Tabulation of responses for full sample (SUM) and sub-tabulations by Missoula neighborhoods (NORTH, CENTRAL, WEST-CENTRAL, SOUTH, & WEST)

1. Which of the following major Missoula area roads do you TRAVEL EVERYDAY or almost everyday?

North-South Roads:	Higgins	Brooks	Reserve	Russell	Orange/Stephens
SUM	**44%**	**35%**	**37%**	**34%**	**33%**
NORTH	58%	31%	15%	23%	40%
CENTRAL	75%	45%	18%	22%	34%
WEST-CENTRAL	31%	32%	37%	46%	41%
SOUTH	39%	47%	35%	57%	73%
WEST	14%	19%	80%	34%	20%

East-West Roads:	South Ave.	3rd St.	39th St.	Broadway	US Interstate 90
SUM	**38%**	**22%**	**39%**	**39%**	**10%**
NORTH	16%	17%	7%	72%	13%
CENTRAL	5%	17%	23%	37%	6%
WEST-CENTRAL	41%	36%	61%	31%	9%
SOUTH	62%	7%	48%	21%	7%
WEST	51%	34%	5%	36%	16%

2. Please rate traffic conditions on the Missoula area ROADS YOU TRAVEL REGULARLY.

Conditions are Good	Neutral/ Undecided	Minor Problems	Serious Problems	No Response	Major Cross-Town Roads
					Traffic on Major North-South Roads.
15%	**9%**	**35%**	**34%**	**7%**	**SUM**
17%	8%	36%	29%	11%	NORTH
16%	9%	40%	29%	7%	CENTRAL
13%	9%	37%	34%	7%	WEST-CENTRAL
17%	8%	36%	34%	5%	SOUTH
14%	7%	27%	47%	5%	WEST

Conditions are Good	Neutral/ Undecided	Minor Problems	Serious Problems	No Response	Major Cross-Town Roads
					Traffic on Major East-West Roads.
17%	**13%**	**40%**	**19%**	**11%**	**SUM**
22%	11%	40%	14%	13%	NORTH
16%	14%	39%	21%	11%	CENTRAL
16%	14%	37%	22%	12%	WEST-CENTRAL
15%	14%	40%	19%	12%	SOUTH
19%	13%	43%	19%	7%	WEST
					Main Roads Where You Live
					Traffic on Main North-South Roads
22%	**13%**	**34%**	**20%**	**7%**	**SUM**
24%	13%	32%	18%	13%	NORTH
25%	12%	36%	17%	11%	CENTRAL
17%	12%	37%	18%	9%	WEST-CENTRAL
22%	14%	37%	18%	9%	SOUTH
23%	15%	28%	24%	12%	WEST
					Traffic on Main East-West Roads
22%	**16%**	**37%**	**12%**	**14%**	**SUM**
24%	14%	35%	11%	16%	NORTH
25%	16%	33%	13%	14%	CENTRAL
17%	15%	42%	15%	12%	WEST-CENTRAL
19%	17%	37%	13%	13%	SOUTH
23%	18%	36%	10%	13%	WEST
					Local Streets Where You Live
					Overall Traffic in your Neighborhood
42%	**11%**	**29%**	**12%**	**7%**	**SUM**
40%	10%	29%	14%	7%	NORTH
42%	9%	31%	11%	7%	CENTRAL
35%	13%	31%	15%	6%	WEST-CENTRAL
42%	10%	28%	10%	9%	SOUTH
48%	11%	25%	10%	6%	WEST
					Traffic on the street where you live
49%	**9%**	**23%**	**11%**	**8%**	**SUM**
48%	8%	21%	12%	7%	NORTH
47%	11%	22%	12%	9%	CENTRAL
42%	10%	27%	13%	6%	WEST-CENTRAL
42%	10%	28%	10%	8%	SOUTH
48%	11%	25%	10%	6%	WEST

3. Using the scale below, please GRADE overall traffic conditions on Missoula area roads you travel regularly.

	A= Excellent	B= Good	C= Fair	D= Poor	E= Very Poor	No Response
SUM	**2%**	**21%**	**40%**	**24%**	**9%**	**4%**
NORTH	3%	24%	40%	21%	7%	6%
CENTRAL	2%	25%	41%	21%	7%	4%
WEST-CENTRAL	2%	17%	41%	26%	10%	5%
SOUTH	2%	19%	44%	23%	8%	5%
WEST	1%	21%	36%	27%	12%	2%

4. In the future (5 years from now), do you expect Missoula's traffic conditions to be:

	Much Improved	Improved	About the same	A little worse	Much worse	No Response
SUM	**1%**	**7%**	**11%**	**26%**	**52%**	**4%**
NORTH	1%	5%	12%	24%	53%	6%
CENTRAL	1%	7%	9%	30%	50%	4%
WEST-CENTRAL	1%	7%	10%	24%	52%	6%
SOUTH	1%	6%	13%	27%	50%	4%
WEST	1%	9%	11%	24%	54%	2%

MISSOULA'S TRANSPORTATION PRIORITIES

5. Which of the following actions should be Missoula's priorities for improving local traffic conditions?

Build OVERPASS or UNDERPASS at Malfunction Junction.

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
19%	**17%**	**17%**	**12%**	**26%**	**10%**	**SUM**
15%	14%	18%	13%	28%	12%	NORTH
23%	16%	19%	10%	23%	9%	CENTRAL
20%	18%	16%	10%	26%	10%	WEST-CENTRAL
18%	18%	14%	13%	28%	10%	SOUTH
17%	20%	19%	15%	22%	8%	WEST

WIDEN/add lanes to major NORTH-SOUTH roads to accommodate more traffic.

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
23%	**26%**	**22%**	**11%**	**9%**	**9%**	**SUM**
13%	20%	25%	15%	16%	11%	NORTH
15%	25%	25%	15%	11%	10%	CENTRAL
22%	26%	23%	11%	8%	12%	WEST-CENTRAL
25%	30%	21%	8%	9%	7%	SOUTH
37%	30%	17%	7%	3%	6%	WEST

WIDEN/add lanes to major EAST-WEST roads to accommodate more traffic.

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
12%	**19%**	**29%**	**18%**	**11%**	**11%**	**SUM**
8%	16%	28%	19%	17%	14%	NORTH
12%	17%	27%	22%	11%	10%	CENTRAL
12%	20%	28%	20%	10%	12%	WEST-CENTRAL
16%	22%	29%	13%	9%	11%	SOUTH
15%	22%	32%	17%	7%	7%	WEST

Improve coordination & timing of traffic signals to speed up traffic flows.

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
34%	**27%**	**22%**	**6%**	**4%**	**8%**	**SUM**
35%	27%	20%	5%	4%	8%	NORTH
34%	27%	21%	7%	3%	9%	CENTRAL
32%	23%	23%	7%	5%	10%	WEST-CENTRAL
34%	28%	20%	5%	5%	8%	SOUTH
37%	27%	23%	5%	4%	5%	WEST

Encourage more people to WALK instead of driving.

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
27%	**14%**	**20%**	**18%**	**15%**	**7%**	**SUM**
40%	16%	18%	12%	10%	6%	NORTH
37%	15%	20%	13%	8%	7%	CENTRAL
29%	14%	19%	17%	14%	7%	WEST-CENTRAL
15%	13%	20%	24%	21%	8%	SOUTH
14%	12%	26%	22%	21%	6%	WEST

Encourage more people to BICYCLE instead of driving.

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
30%	**14%**	**15%**	**17%**	**18%**	**6%**	**SUM**
43%	15%	14%	13%	10%	5%	NORTH
41%	17%	12%	13%	12%	6%	CENTRAL
33%	11%	13%	18%	19%	7%	WEST-CENTRAL
17%	11%	17%	21%	27%	6%	SOUTH
17%	15%	19%	22%	22%	5%	WEST

Increase ridership on Missoula's "Mountain Line" BUS SERVICE.

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
30%	**21%**	**23%**	**12%**	**9%**	**5%**	**SUM**
40%	23%	18%	8%	7%	5%	NORTH
40%	21%	19%	9%	6%	5%	CENTRAL
30%	21%	22%	12%	9%	6%	WEST-CENTRAL
20%	17%	29%	16%	13%	6%	SOUTH
18%	20%	28%	16%	13%	5%	WEST

Encourage more people to CARPOOL to work and school.

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
25%	**20%**	**26%**	**14%**	**9%**	**6%**	**SUM**
36%	22%	20%	11%	6%	6%	NORTH
35%	23%	20%	13%	5%	5%	CENTRAL
27%	18%	25%	15%	9%	7%	WEST-CENTRAL
16%	18%	31%	17%	12%	5%	SOUTH
13%	22%	32%	16%	12%	5%	WEST

Widen traffic lanes & improve flows by REDUCING PARKING along major streets.

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
11%	**19%**	**23%**	**23%**	**17%**	**6%**	**SUM**
9%	16%	18%	27%	22%	9%	NORTH
10%	19%	22%	22%	17%	10%	CENTRAL
12%	20%	24%	21%	15%	9%	WEST-CENTRAL
12%	19%	25%	21%	17%	6%	SOUTH
12%	20%	26%	23%	14%	6%	WEST

MOVE drive-through truck traffic from Reserve St. to TRUCK ROUTE located to WEST OF AIRPORT.

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
22%	**25%**	**23%**	**12%**	**9%**	**11%**	**SUM**
23%	23%	23%	11%	10%	11%	NORTH
22%	27%	24%	10%	8%	12%	CENTRAL
20%	25%	24%	14%	9%	9%	WEST-CENTRAL
20%	24%	25%	14%	8%	9%	SOUTH
24%	24%	18%	12%	14%	8%	WEST

RELOCATE US HIGHWAY 93 from Reserve St. to WEST OF AIRPORT.

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
20%	**23%**	**23%**	**12%**	**13%**	**10%**	**SUM**
18%	23%	24%	12%	12%	11%	NORTH
20%	20%	24%	12%	10%	13%	CENTRAL
18%	22%	23%	14%	13%	10%	WEST-CENTRAL
22%	25%	21%	13%	12%	7%	SOUTH
19%	23%	20%	12%	18%	7%	WEST

REQUIRE LARGE EMPLOYERS to develop programs encouraging workers to carpool, ride buses, walk, and bike to jobs instead of driving separate vehicles.

Very High Priority	High Priority	Moderate Priority	Low Priority	Not a Priority	No Response	
24%	**15%**	**19%**	**17%**	**18%**	**7%**	**SUM**
31%	19%	16%	15%	13%	7%	NORTH
33%	15%	17%	12%	15%	8%	CENTRAL
25%	15%	20%	16%	17%	7%	WEST-CENTRAL
14%	15%	21%	19%	23%	8%	SOUTH
16%	11%	23%	22%	22%	7%	WEST

6. If Missoula substantially improves the CONVENIENCE and RELIABILITY of LOCAL BUS SERVICE, how often will you RIDE THE BUS INSTEAD OF DRIVING?

4 or more days a week	2-3 days a week	1 day a week	1-2 days a month	Once every few months	Never	No Response	
12%	**19%**	**9%**	**8%**	**14%**	**31%**	**7%**	**SUM**
15%	25%	12%	9%	11%	22%	7%	NORTH
12%	22%	12%	10%	18%	21%	6%	CENTRAL
12%	18%	10%	6%	18%	29%	7%	WEST-CENTRAL
13%	12%	5%	8%	16%	40%	7%	SOUTH
14%	19%	9%	15%	6%	44%	7%	WEST

7. If substantial improvements are made to BICYCLE LANES LOCATED ALONG MISSOULA ROADS, how often will you BICYCLE INSTEAD OF DRIVING (weather permitting)? Bike lanes would be clearly identified by roadside signs and on-pavement markings.

4 or more days a week	2-3 days a week	1 day a week	1-2 days a month	Once every few months	Never	No Response	
21%	**16%**	**7%**	**6%**	**9%**	**35%**	**6%**	**SUM**
30%	20%	8%	6%	6%	25%	6%	NORTH
30%	17%	8%	6%	7%	29%	5%	CENTRAL
24%	17%	4%	5%	10%	32%	8%	WEST-CENTRAL
9%	13%	6%	7%	3%	45%	7%	SOUTH
10%	12%	9%	6%	2%	45%	7%	WEST

8. If Missoula develops an extensive network of BICYCLE PATHS SEPARATED FROM ROADS, how often will you BICYCLE INSTEAD OF DRIVING (weather permitting)?

4 or more days a week	2-3 days a week	1 day a week	1-2 days a month	Once every few months	Never	No Response	
26%	**16%**	**5%**	**6%**	**8%**	**33%**	**6%**	**SUM**
37%	19%	6%	5%	5%	24%	6%	NORTH
36%	16%	4%	6%	6%	26%	6%	CENTRAL
29%	17%	3%	6%	9%	29%	8%	WEST-CENTRAL
13%	14%	4%	7%	12%	43%	7%	SOUTH
14%	15%	6%	7%	10%	43%	6%	WEST

9. If Missoula constructs new sidewalks and repairs existing sidewalks in residential and business areas, how often will you WALK INSTEAD OF DRIVING (weather permitting)?

4 or more days a week	2-3 days a week	1 day a week	1-2 days a month	Once every few months	Never	No Response	
14%	**19%**	**10%**	**11%**	**11%**	**28%**	**7%**	**SUM**
20%	22%	11%	9%	9%	21%	8%	NORTH
23%	22%	12%	12%	8%	17%	7%	CENTRAL
16%	23%	11%	10%	11%	23%	7%	WEST-CENTRAL
9%	14%	11%	12%	14%	34%	7%	SOUTH
6%	12%	7%	11%	13%	44%	8%	WEST

10a. If a CARPOOL or vanpool is formed near your home, how often WILL YOU CARPOOL to work or school?

4 or more days a week	2-3 days a week	1 day a week	1-2 days a month	Once every few months	Never	No Response	
9%	**6%**	**6%**	**6%**	**7%**	**50%**	**11%**	**SUM**
9%	14%	7%	6%	8%	47%	11%	NORTH
10%	11%	4%	5%	7%	51%	12%	CENTRAL
9%	12%	6%	6%	7%	48%	13%	WEST-CENTRAL
9%	14%	11%	12%	14%	34%	7%	SOUTH
10%	10%	4%	5%	6%	55%	10%	WEST

10b. If Missoula develops a program to help start carpools, WILL YOU PARTICIPATE by providing your address and travel times to transportation staff?

Yes, Definitely	Probably	Undecided	No	I'd rather organize a carpool myself	No Response	
11%	**15%**	**17%**	**39%**	**9%**	**10%**	**SUM**
13%	16%	17%	38%	8%	9%	NORTH
16%	15%	15%	37%	9%	10%	CENTRAL
9%	18%	19%	35%	10%	9%	WEST-CENTRAL
8%	12%	18%	42%	10%	11%	SOUTH
9%	13%	15%	45%	8%	11%	WEST

DRIVING IN MISSOULA

11. How often (if ever) do you intentionally drive on side streets to avoid traffic congestion on major roads?

Everyday/ almost everyday	A few times a week	A few times a month	Never	No Response	
39%	**31%**	**17%**	**8%**	**6%**	**SUM**
37%	31%	17%	8%	6%	NORTH
38%	35%	17%	7%	4%	CENTRAL
45%	27%	14%	7%	7%	WEST-CENTRAL
34%	30%	21%	9%	6%	SOUTH
38%	33%	18%	6%	5%	WEST

12a. Are you able to change your travel characteristics during AIR ALERT DAYS?

Yes	Sometimes	No	No Response	
13%	**38%**	**42%**	**7%**	**SUM**
16%	41%	34%	9%	NORTH
15%	46%	34%	6%	CENTRAL
15%	36%	42%	8%	WEST-CENTRAL
11%	36%	46%	8%	SOUTH
7%	33%	53%	7%	WEST

12b. If you are able to change your travel during AIR ALERT DAYS, what do you do? (CHECK ALL RESPONSES THAT APPLY)

I drive less	I carpool	I ride bus	I walk	I bicycle	No Response	
39%	**3%**	**8%**	**10%**	**10%**	**32%**	**SUM**
37%	3%	7%	10%	15%	25%	NORTH
27%	3%	5%	8%	6%	26%	CENTRAL
29%	1%	4%	7%	7%	33%	WEST-CENTRAL
41%	2%	3%	3%	3%	37%	SOUTH
44%	2%	4%	2%	2%	38%	WEST

Appendix B Summary of Recommended Projects

B.1 Committed Major Network Improvement Projects

These improvements are based on previous planning efforts, and committed to development by Missoula County, the City of Missoula, and the Montana Department of Transportation. For the purposes of this Plan, a Committed Project is one that had TPCC approval at the time the Plan was developed. There are 23 Committed Projects amounting to nearly $32.5 million in improvements.

1. North Reserve Street Widening (Third to I-90) NHS 0002(110)

Problem: Capacity/safety related

Recommendation: Widen to four lanes from S. 3rd Street to Mullan Rd. Widen to five lanes from Mullan Road to I-90. Bridge widening over the Clark Fork River will be necessary for this project. See CMAQ Improvement Project #3 on page B-5 for Reserve Street Pedestrian and Bicycle Improvements.

Estimated Cost: **$ 18,124,000**
Funding Source: multiple sources

2. Reserve Street Landscaping and Ped/Bike Improvements STPE 8103(10)

Problem: Beautification related

Recommendation: Landscape the area immediately adjacent to the west side of Reserve Street between South Avenue and Brooks Street and provide new pedestrian and bicycle facilities. (This project has been completed.)

Estimated Cost: **$ 240,000 (Done)**
Funding Source: STPE

3. Airport Interchange DPI 0195(001)

Problem: Access to the airport and proposed industrial park

Recommendation: Construct a new diamond interchange on I-90 east of Johnson Bell Field, connecting to East Broadway south of the interstate and to Enterprise Road north of I-90. The new interchange will provide access to the airport and to a proposed industrial park south of the interstate.

Estimated Cost: **$ 9,545,909**
Funding Source: Demonstration Project Funds

4. Fort Missoula Trolley Car Restoration STPE 8199(3)

Problem: Increasing historic awareness

Recommendation: Restore a trolley car at Fort Missoula.

Estimated: **$ 100,000**
Funding Source: STPE

5. Shady Grove Trail (Burton to Russell) STPE 8199(17)

Problem:	Bicycle & Pedestrian availability
Recommendation:	Construct a new pedestrian/bicycle trail along the Clark Fork River between Burton and Russell. (This project has been completed.)

Estimated Cost: **$ 102,000 (Done)**
Funding Source: STPE, City CTEP

6. South 14th Street West/Johnson Street Signal STPHS-HES 8199(22)

Problem:	This is a "T" intersection with stop control on Johnson. Partial stop bars are marked only in front of the crosswalk. The intersection is routinely congested, with long queues forming on Johnson Street approaches during peak hours. There is an abundance of signs on the eastbound approach to the intersection. (This project is in progress.)
Recommendation:	Signalize the intersection. Provide turn bays on 14th. (Warrant study has been completed.) The long-term solution should include additional lanes and protected left turn phasing on Johnson.

Estimated Cost: **$ 120,000**
Funding Source: MDT, STPU

7. SW Higgins Widening (Russell to High Park) (Other Major Project #20))

Problem:	Capacity related
Recommendation:	Widen roadway to five lanes, including bike lanes and sidewalks.

Estimated Cost: **$ 80,000**
Funding Source: City, STPU

8. Mullan Road Irrigation Ditch

Problem:	Existing ditch is within the highway right-of-way
Recommendation:	Relocate the irrigation ditch adjacent to Mullan Road.

Estimated Cost: **$ 140,000 (Done)**
Funding Source: County

9. Mullan Road Realignment (Old Milwaukee "S" Curves) STPS 263-1(10)9

Problem:	Safety related
Recommendation:	Reconstruct and realign roadway to minimize the curve section. (This project is in progress.)

Estimated Cost: **$ 65,000**
Funding Source: RR Safety, County

10. Blue Mountain Road Realignment

Problem: Air quality, safety related

Recommendation: Realign the two-mile section of Blue Mountain Road north of its junction with U.S. 93. Widen and pave the roadway to a 38' width.

Estimated Cost: **$ 750,000**

Funding Source: County, Forest Service

11. U.S. 93 Realignment (Glacier and Ridgeway Roads) STPS 7-2(19)84

Problem: Capacity & safety related

Recommendation: Realign and signalize intersection, eliminating offset. Some right-of-way will be needed for the project.

Estimated Cost: **$ 300,000**

Funding Source: Safety Funds, County

12. Upper Rattlesnake/East Missoula Paving

Problem: Air quality related

Recommendation: Pave various streets in the Upper Rattlesnake and East Missoula areas.

Estimated Cost: **$ 625,000**

Funding Source: County

13. Boulevard/Park Tree Replacement

Problem: Beautification

Recommendation: Replace trees in various boulevards and park areas.

Estimated Cost: **$ 38,400**

Funding Source: City CTEP

14. East Front/Madison and Van Buren Bicycle Crossing

Problem: The present configuration of median islands and crosswalks do not adequately provide for eastbound bicyclists in crossing Madison Street.

Recommendations: Minor modifications should be made to the westernmost median island so that bicyclists can cross. A defined crossing should be provided for eastbound bicyclists. The southernmost end of the west median island on Madison should be extended 50 feet to the south using pin-down curbing.

Maintenance Jurisdiction: City (State Contract)

Estimated Cost: **$ 25,000**

Funding Source: City CTEP, State Maintenance

15. West Broadway Sidewalks (Front to Russell) STPE 71-1(13)3
Problem: Pedestrian safety
Recommendation: Construct new sidewalks along West Broadway between Front and Russell.
Estimated Cost: **$ 324,000**
Funding Source: City CTEP, STEP

16. City Park Sidewalks
Problem: Sidewalk cohesiveness
Recommendation: Construct new sidewalks in various city parks.
Estimated Cost: **$ 174,000**
Funding Source: City CTEP

17. Curb Ramps/Alley Sidewalks
Problem: Pedestrian safety
Recommendation: Construct new curb ramps and alley sidewalks at various locations.
Estimated Cost: **$ 57,500**
Funding Source: City CTEP

18. Historic Trail Markers/Displays
Problem: Historic awareness
Recommendation: Millstones as historic trail markers.
Estimated Cost: **$ 37,710**
Funding Source: City CTEP

19. Milwaukee RR Right-of-Way Acquisition STPE 8199(11)
Problem: Land not being used by RR & could be used for other purposes
Recommendation: Purchase railroad right-of-way. (This project has been completed.)
Estimated Cost: **$ 232,400**
Funding Source: City CTEP, STPE

20. Trail Development
Problem: Deficiency of Pedestrian/Bike facilities
Recommendation: Develop new pedestrian and bicycle trails.
Estimated Cost: **$ 115,000**
Funding Source: City CTEP

21. Broadway Riverfront Acquisition
Problem: Need for bicycle and pedestrian trail system along riverfront.
Recommendation: Purchase necessary right-of-way. (This project is in progress.)
Estimated Cost: **$ 63,500**
Funding Source: City CTEP

22. Stephens Avenue Boulevard

Problem: Pedestrian un-friendly corridor

Recommendation: Install a center boulevard with trees.

Estimated Cost: **$ 192,500**

Funding Source: City CTEP

23. West Broadway Widening (Airport to Flynn)

Problem: Existing facility is two-lane

Recommendation: Widen West Broadway to four lanes between the airport and Flynn Road.

Estimated Cost: **$ 1,000,000**

Funding Source: STPP

B.2 CMAQ Improvement Projects

Listed below are the Congested Mitigation and Air Quality (CMAQ) Improvement Projects. All or part of each improvement listed in this section will be financed through the CMAQ program. The projects are listed the order of implementation priority. There are 18 CMAQ Projects amounting to approximately $39.6 million in improvements.

1. Bicycle/Pedestrian Coordinator Program Supplement CM 8199(21)

Problem: Bicycle/Pedestrian concerns

Recommendation: Provide an annual program supplement to partially fund the City bicycle/pedestrian coordinator and programs.

Estimated Cost: **$ 24,000/yr**

Possible Funding Source: CMAQ Allocation

2. Area wide Traffic Signal Project CM 0002(114)

Problem: Optimization of current traffic signal system

Recommendation: Evaluate all traffic signals within the city. Evaluate existing signal hardware and optimize the operation of the citywide traffic signal system. (This project is in progress.)

Estimated Cost: **$ 4,920,000**

Possible Funding Source: CMAQ

3. North Reserve Street Bicycle/Pedestrian Improvements

Problem: Need for transit/bicycle/pedestrian facilities along North Reserve

Recommendation: Install transit/bicycle/pedestrian improvements. See Committed Improvement Project #1 on page B-1.

Estimated Cost: **$ 5,200,000**

Possible Funding Source: CMAQ

4. Mountain Line Downtown Circulator Bus

Problem: Need for transit system improvement

Recommendation: Provide downtown circulator bus and operation assistance to the Mountain Line. (This project is in progress.)

Estimated Cost: **$ 460,000**

Possible Funding Source: CMAQ, Urban Mass Transit Assistance, Parking Commission, MRA

5. Mountain Line Bus Upgrade

Problem: Deteriorating buses

Recommendation: Purchase ten new transit vehicles to replace old buses in the Mountain Line fleet. The listed cost for this project represents the final installment for the purchase of the ten new buses.

Estimated Cost: **$ 45,000**

Possible Funding Source: CMAQ

6. Mountain Line Off-Street Transit Facility

Problem: The current on-street transit exchange point creates traffic and safety problems

Recommendation: Construct an off-street transit facility.

Estimated Cost: **$ 500,000**

Possible Funding Source: CMAQ, Urban Mass Transit Assistance

7. Primary Sidewalk Network

Problem: Need for cohesive sidewalk system

Recommendation: Construct new sidewalks at various locations as outlined in the Missoula Sidewalk Master Plan.

Estimated Cost: **$ 3,100,000**

Possible Funding Source: CMAQ

8. Bicycle Commuter Network

Problem: Need for commuter bicycle facility improvements, adjacent to arterial road system throughout community.

Recommendation: Install designated bicycle lanes and bicycle routes as necessary.

Estimated Cost: **$ 622,000**

Possible Funding Source: CMAQ

9. Bicycle Lanes

Problem:	Need for bicycle lanes to be added to infrastructure in order to connect commuter bicycle network to neighborhoods
Recommendation:	Designate and install bike lanes.

Estimated Cost: **$ 325,000**
Possible Funding Source: CMAQ

10. North Side Pedestrian/Bicycle Access #1

Problem:	Pedestrian/bicycle access
Recommendation:	Construct a new pedestrian/bicycle overpass crossing the Montana Rail Link tracks to connect the CBD with the north side of town.

Estimated Cost: **$ 1,200,000**
Possible Funding Source: CMAQ

11. California Street Pedestrian/Bicycle Bridge

Problem:	Bike/pedestrian access
Recommendation:	Construct bike/pedestrian bridge over the Clark Fork River north of California Street to connect riverside trail networks on both sides of the river.

Estimated Cost: **$ 600,000**
Possible Funding Source: CMAQ

12. Orange Street Bridge STPU 8107(10)

Problem:	The Orange Street Bridge over the Clark Fork River is a vital link in the network connecting the south side of the City with the CBD and the Interstate. This concrete structure was originally constructed in 1937 and supports a 30-foot-wide two-lane roadway section.
Recommendation:	Widen Orange Street to four lanes from Front to First Streets. Reconstruct the existing bridge structures to accommodate four lanes for vehicle travel plus bike lanes and sidewalks over the Clark Fork river. Bridge approaches would also be reconstructed as part of this project.

Estimated Cost: **$ 4,775,000**
Possible Funding Source: CMAQ, Federal Aid Urban Funds,
County Bridge Fund,
Bridge Rehabilitation and
Replacement Fund

13. Brooks/South/Russell Traffic Improvement - Phase 1 CM 0002(105)

Problem: Traffic related

Recommendation: Study existing traffic situation, recommend improvements, and implement changes to improve traffic operations at this six-leg intersection. The study portion of this project is underway.

Estimated Cost: **$ 1,700,000**
Possible Funding Source: CMAQ

14. Brooks/South/Russell Traffic Improvement - Phase 2

Problem: Traffic related

Recommendation: This project is an extension of CMAQ Project #13. This second phase of the project focuses on geometric changes which will relieve or eliminate traffic congestion at the intersection. A study is currently underway for this phase two project.

Estimated Cost: **$ 5,500,000**
Possible Funding Source: CMAQ

15. North Side Pedestrian/Bicycle Access #2

Problem: There is inadequate pedestrian and bicycle access between the CBD and the North Side residential community. The MRL tracks are a significant ped/bike barrier.

Recommendation: Construct a pedestrian-bicycle overpass of the MRL lines.

Estimated Cost: **$ 1,200,000**
Possible Funding Source: CMAQ

16. South Avenue Walkway/Bikeway (Reserve to 38th)

Problem: Bike/pedestrian access

Recommendation: Construct a new paved pedestrian/bicycle path along the south side of South Avenue.

Estimated Cost: **$ 262,000**
Possible Funding Source: CMAQ

17. Mountain Line Park and Ride Lots

Problem: Need for Park and Ride facilities

Recommendation: Acquire the necessary R/W and construct Park and Ride facilities at several locations within the community.

Estimated Cost: **$ 685,000**
Possible Funding Source: CMAQ

18. Miscellaneous Transit Improvements

Problem: Need for Expanded Transit Service

Recommendation: The specific project details have not been determined at this time. Project details will be determined at a later date.

Estimated Cost: **$2,000,000**

Possible Funding Source: CMAQ

B.3 Other Major Network Improvement Projects

The Other Major Network Improvement Projects are listed below. In addition to Committed and CMAQ Projects, these projects are recommended to meet the needs of the future. The 22 Other Major Network Improvements will require nearly $36.4 million for their implementation.

1. South Third Street Reconstruction (Reserve to Russell)

Problem: Capacity. This mile-long corridor currently accommodates approximately 9,500 VPD. The present roadway lies within a 60-foot right-of-way with a paved surface that is 24-feet wide carrying two travel lanes with dirt shoulders. By the year 2010 over 17,000 VPD will travel this route.

Recommendation: Reconstruct to three-lanes (two travel lanes and a continuous center two-way left-turn lane), plus bike lanes, on-street parking, curb and gutter, and sidewalks. This project will result in an overall benefit to local air quality.

Estimated Cost: **$ 2,500,000**

Possible Funding Source: STPU, City, Gas Tax

2. Russell Street Widening (River to Third)

Problem: Capacity related

Recommendation: Widen the roadway to five lanes (two travel lanes in each direction plus a continuous center two-way left-turn lane) plus bike lanes and sidewalks.

Estimated Cost: **$ 1,500,000**

Possible Funding Source: STPU, City

3. Russell Street Bridge Reconstruction

Problem: Capacity. The Russell Street Bridge over the Clark Fork River was built in 1957. It is a concrete structure supporting a 24-foot-wide two-lane driving structure with narrow sidewalks on both sides. This structure presently carries approximately 16,000 VPD and typically is congested during the peak travel periods of the day. The efficiency of the intersection at Russell and Broadway is adversely affected due to the close proximity of the bridge to the intersection. Current traffic demand calls for two southbound travel lanes away from the intersection. The existing two-lane bridge precludes this option. Traffic volumes over this structure are projected to increase to 20,000 vehicles per day by the year 2010.

Recommendation: Reconstruct this bridge to a five-lane section (providing two travel lanes in each direction, and a northbound left-turn lane) plus bike lanes and sidewalks on both sides. This should be accomplished through a two-phase construction contract. Phase I would include construction of a new structure on the upstream side of the existing bridge to carry northbound traffic. Phase 2 should consist of a complete rehabilitation of the existing structure to provide for southbound traffic. Rehabilitation will include total deck replacement and repainting all steel members. Approach modifications will be required from the bridge north to Broadway and south to Idaho Street. This project will extend the useful life of the existing bridge at least fifty years. Some additional right-of-way will be required for the project.

Estimated Cost: **$ 5,000,000**
Possible Funding Source: STPU, County Bridge Fund
Bridge Rehabilitation and
Replacement Fund

4. Airport/Mullan Street Grid

Problem: Anticipated growth

Recommendation: The intent of this project is to provide a minor arterial grid network within the area bounded by Mullan Road and West Broadway west of Reserve Street for future development. All of the new roads would be paved for two-lanes of traffic plus bike lanes and sidewalks.

Estimated Cost: **$ 4,200,000**
Possible Funding Source: Private

5. Miscellaneous Pedestrian/Bicycle System Improvements

Problem: Pedestrian/Bicycle access

Recommendation: Provide new bike lanes and sidewalks at various locations - project to be defined at a later time.

Estimated Cost: **$ 2,100,000**
Possible Funding Source: City, County, Private, G.O. Bonds, SID,
RSID

6. Mullan Road Overlay (Reserve to Broadway)

Problem: Safety related

Recommendation: Overlay and pave shoulders of roadway.

Estimated Cost: **$ 300,000**
Possible Funding Source: STPU

7. Madison Street River Bridge - South Approach Reconstruction

Problem: Eliminate the circulation of traffic on Maurice Street between Fifth and Sixth

Recommendation: Reconstruct the south bridge approach by extending the four traffic lanes south along Arthur Street to South Sixth Street. The project should include acquisition of needed right-of-way, realigning the south bridge approach, widening Arthur Street between Fifth and Sixth Streets, and modifying the intersection of Sixth and Arthur.

Estimated Cost: **$ 590,000**
Possible Funding Source: City, STPU

8. Russell Street Widening (Fifth to Mount)

Problem: Capacity related

Recommendation: Purchase additional right-of-way and widen the existing two-lane section to five lanes plus bike lanes and sidewalks.

Estimated Cost: **$ 4,000,000**
Possible Funding Source: STPU

9. Mullan Road Widening (First ½ Mile West of Reserve)

Problem: Safety related

Recommendation: Widen roadway from 24' to 32', paving shoulder areas.

Estimated Cost: **$ 250,000**
Possible Funding Source: City, County

10. North Side Greenway Trail

Problem: Bike/pedestrian access

Recommendation: Construct a non-motorized (pedestrian/bike) trail connecting various locations on the north side of the railroad tracks. Intended to connect to the two new pedestrian/bike overpasses described in "CMAQ Projects". The trail should extend from Greenough Drive to Scott Street.

Estimated Cost: **$ 292,250**
Possible Funding Source: City, Private

11. South Reserve Street Pedestrian/Bicycle Improvements (Third to 39th)

Problem: Pedestrian/Bicycle access

Recommendation The intent of this project is to improve the pedestrian/bike environment of this portion of Reserve Street. Specific details of the project have not yet been identified. It is believed that the project could address any of the following improvements: sidewalks, bike paths, landscaping, or center channelizing medians.

Estimated Cost: **$ 500,000**
Possible Funding Source: STPE

12. Johnson Street Extension

Problem:	Capacity related
Recommendation:	Construct a new portion of Johnson Street with a general alignment along the west boundary of the Mall, connecting South Avenue to Brooks. The new roadway would include two travel lanes, bike lanes, and sidewalk.

Estimated Cost: **$ 750,000**
Possible Funding Source: City, Private

13. West Broadway Corridor Lighting (Flynn Lane to Bitterroot Branch Railroad Tracks)

Problem:	Safety related
Recommendation:	Install a corridor lighting system along the existing four-lane roadway with raised center medians.

Estimated Cost: **$ 695,000**
Possible Funding Source: STPP, State Maintenance Funds

14. Stephens Median Installation (Orange to Mount)

Problem:	This section of Stephens is extremely wide with approximately 20 feet of dirt between travel lanes and curb line. This excess width contributes to air pollution problems as well as signing and channelization problems.
Recommendation:	Construct a four-lane facility with a wide, landscaped median plus bike lanes. The existing roadway already has curb and gutter and sidewalks.

Estimated Cost: **$ 400,000**
Possible Funding Source: STPU, State Maintenance Funds

15. Higgins Avenue Reconstruction (Pattee Canyon Road to South Avenue)

Problem:	This portion of Higgins Avenue is 32 feet wide and carries over 9,000 vehicles per day. The existing two-lane road has no shoulders or pedestrian/bike facilities. This road serves as a major connector between the South Hills residential area and the University/Downtown area. Traffic volumes are anticipated to exceed 15,000 VPD by the year 2010.
Recommendation:	Construct three-lane facility plus bike lanes and a curb and gutter section with sidewalks. This project will include the redesign of the Higgins/Pattee Canyon intersection. Intersection work will consist of realigning Pattee Canyon Road so it intersects Higgins one block farther north at Sentinel Avenue. This location will provide the necessary room for the proper expansion of this intersection in the future. Since this portion of Higgins has 80 feet of right-of-way, no land acquisition will be required.

Estimated Cost: **$ 1,420,000**
Possible Funding Source: STPU, State Maintenance Funds, City

16. Higgins Avenue Bicycle Lanes and Intersection Improvement (South to Brooks)

Problem:	Capacity and safety related
Recommendation:	Remove parking from one or both sides of the street, and restripe to accommodate three travel lanes and bike lanes within the existing curb lines. This project will include the redesign and signalization of the Higgins/Beckwith intersection. The recommended realignment of the intersection is as follows: Mount would be rerouted onto Hill, while to the east Beckwith would angle south to best align with the west approach. The greatest adverse traffic impact will be felt on Beckwith northwest of the new intersection. The northwest approach on Beckwith should be restricted to right turn movements only to minimize the vehicle conflicts west of the intersection.

Estimated Cost: **$ 666,000**

Possible Funding Source: STPU, State Maintenance Funds, City

17. South Avenue Reconstruction (Reserve to Russell)

Problem:	This mile long portion of South Avenue is presently a two-lane rural section in poor condition with most of the pavement section being 18 feet to 20 feet wide with dirt shoulders. Located at either end of this corridor are Missoula's two most congested intersections. These problem intersections have previously been identified for reconstruction improvements (South/Reserve - reconstruction completed, Brooks/South/Russell - CMAQ Project #3). The South Avenue corridor recorded traffic volumes ranging from 10,000 to 13,000 VPD in 1985. The traffic assignment model projects over 17,000 VPD will travel this portion of South Avenue in the year 2010.
Recommendation:	Reconstruct to three-lane urban section with curb and gutter, bike lanes and sidewalks. The right-of-way is generally 60-feet wide along this section of South Avenue.

Estimated Project Cost: **$ 4,000,000**

Possible Funding Source: STPU, County Road Fund, City General Fund

18. 39th Street/SW Higgins Widening (U.S. 93 to Pattee Canyon Dr.)

Problem:	The 39th Street, SW Higgins corridor is the major collector serving Pattee Canyon and the entire South Hills residential area. Traffic volumes on this east-west corridor will increase to over 15,000 VPD by the year 2010. Thirty-ninth Street is 24 feet wide while Southwest Higgins is slightly wider at 32 feet. The existing two-lane rural cross-section will not adequately handle the anticipated traffic volumes.
Recommendation:	Construct a three-lane urban section with bike lanes and sidewalks; except for the five-lane portion of SW Higgins between Russell and Bancroft/High Park

(Committed Project #7). The existing right-of-way is 70-feet-wide on 39th Street and 100-feet-wide on SW Higgins. No right-of-way acquisition should be necessary.

Estimated Cost: **$ 5,800,000**

Possible Funding Source: STPU, County Road Fund, City

19. Mary Street Extension

Problem: The current roadway is not continuous

Recommendation: Mary Street is an existing two-lane local street connecting to Reserve Street. Extend the roadway across the Bitterroot Spur Railroad to connect to the Mall. The new extension will be a two-lane section with bike lanes, and sidewalks will be added where necessary.

Estimated Cost: **$ 250,000**

Possible Funding Source: City, Private

20. Rattlesnake Drive Shoulders and Left-Turn Bays (Lolo to Creek Crossing)

Problem: Safety related

Recommendation: Add paved shoulders along this section of Rattlesnake Drive. Provide left-turn bays at the grade school and the Brookside subdivision.

Estimated Cost: **$ 500,000**

Possible Funding Source: City, STPU

21. South Hills Trail

Problem: Pedestrian/bicycle access

Recommendation: Construct a non-motorized (pedestrian/bike) trail system connecting several neighborhoods in the South Hills area.

Estimated Cost: **$ 161,000**

Possible Funding Source: City, Private

22. Lolo Street Reconstruction (Duncan to Rattlesnake)

Problem: Need to realign and upgrade this street

Recommendation: Reconstruct a two-lane roadway with a more appropriate grade and alignment, including bike lanes and sidewalks.

Estimated Cost: **$ 500,000**

Possible Funding Source: City, STPU

B.4 TSM Improvement Projects

The Transportation System Management (TSM) concept covers a broad range of improvement types and emphasizes actions or strategies that ensure the efficient use of existing road space, reduce vehicle use in congested areas, improve transit service, and improve internal management efficiency. TSM-type improvements are generally short-range, low cost projects that may take only a year or two to plan and implement. There are 38 TSM Projects amounting to nearly $640,000 in improvements.

1. Mullan Road Curve Warnings (milepost 2.9-3.1)

Problem: The accident history indicates that during the four and one-half year study period 14 accidents occurred at this location near Cemetery Hill. Most accidents were single vehicle accidents where the driver missed the curve and left the roadway.

Recommendation: Install a curve warning sign with 35-mph advisory speed plaque on the west approach and chevron warning signs along the south side of curve (chevrons to face both directions).

Estimated Cost: **$ 2,600**
Possible Funding Source: STPS, County Road Fund, Safety Funds

2. Mullan Road Curve Warnings (milepost 2.0-2.2)

Problem: The accident records reflect that 14 accidents occurred on or near the curve located west of Hellgate Store during the four and one-half year study period.

Recommendation: Install curve warning signs on east and west approaches and a series of reflectorized delineators along south side of curve (use double-faced delineators).

Estimated Cost: **$ 750**
Possible Funding Source: STPS, County Road Fund, Safety Funds

3. Mullan Road Curve Warnings (milepost 0.9-1.1)

Problem: During the four and one-half year study period, ten accidents occurred along this curved section of Mullan. Most of the accident involved westbound vehicles leaving the roadway in the curve.

Recommendation: Install a curve warning sign on the east approach and add four additional chevron signs to those existing on the north side of the curve.

Estimated Cost: **$ 860**
Possible Funding Source: STPS, County Road Fund, Safety Funds

4. Front & Ryman Parking Restrictions

Problem: Sight distance is limited on the north approach looking west. This is caused by vehicles parked on the north side of Front Street.

Recommendation: Restrict parking on the north side of Front Street west of the intersection (five spaces).

Estimated Cost: **$ 550**
Possible Funding Source: City, MRA

5. Greenough Hill Re-Alignment

Problem:	The combination of high vehicle speeds and poor roadway alignment results in a potentially hazardous situation on Greenough Hill. The speed limit on Duncan Road is posted 25 mph which is appropriate for Greenough Hill. Most motorists travel at approximately 35 mph down the hill.
Recommendation:	The alignment of the road just north of the Interstate underpass should be straightened by shifting the west side guard rail to the west and adding to the pavement on the inside of the curve. Minor storm sewer adjustments will be required. A 25 mph speed limit sign should be mounted half way down the hill and enforcement measures increased.

Estimated Project Cost: **$ 4,800**
Possible Funding Source: City

6. Front & Madison Median Modification

Problem:	The present configuration of median islands and crosswalks does not adequately provide for eastbound bicyclists crossing Madison Street.
Recommendation:	Minor modifications to the westernmost median island should be made so bicyclists can cross it. A defined crossing for the eastbound bicyclists should be provided. The southernmost end of the west median island on Madison should be extended 50 feet to the south using pin-down curbing.

Estimated Cost: **$ 2,400**
Possible Funding Source: State Maintenance Funds

7. Broadway Lighting (One-Half Block East of Van Buren Street)

Problem:	This half block section of Broadway has a raised median island but no roadway lighting.
Recommendation:	Install roadway lighting to illuminate the median along this one-half block section of Broadway.

Estimated Cost: **$ 15,400**
Possible Funding Source: STPU, State Maintenance Funds

8. East Broadway & I-90 Curve Warnings

Problem:	A four and one-half year accident history at this location indicates that 18 accidents were reported, of which two-thirds occurred at night.
Recommendation:	Remove the existing directional arrows and install a series of chevron warning signs for both east- and westbound traffic along the outside of the curve south of the railroad underpass. Remove the two existing curve warning signs and install similar oversized signs with advisory speed plaques. The sign for westbound traffic should be installed in the same location as the existing sign while the sign for eastbound traffic should be installed 750 feet west of the curve. The object marker signs at the railroad underpass should

be reset to better identify the most protruding portions of the structure. The railroad underpass should be widened at some time in the future when reconstruction of the structure is required.

Estimated Cost: **$ 3,900**
Possible Funding Source: State Maintenance Funds, Safety Funds

9. I-90 On-Ramp Reconstruction (East Missoula Interchange)

Problem: The accident records indicate that 23 accidents occurred at this location during the four and one-half year study period. The majority of these accidents occurred on the westbound on-ramp. The accidents were typically at night involving a single vehicle leaving the roadway.

Recommendation: Reconstruct the westbound on-ramp to provide a less curved alignment. Straightening the initial curve section can be accomplished by filling and paving the inside of the curve. Install a series of reflectorized delineators along both sides of the entire westbound on-ramp.

Estimated Cost: **$ 19,000**
Possible Funding Source: Interstate 4-R Funds

10. South Third & Clements Visibility Improvements

Problem: Twelve accidents were reported at this location during the four and one-half year study period. The roadway alignment combined with limited sight distance in the curve is the source of the problem.

Recommendation: Trim roadside vegetation along the north side of Third Street and on the inside of the curve. Realign existing chevron warning signs so they are more visible on both approaches. Four additional chevron signs will be required to achieve the desired visual effect. The outside of the curve should be made safer by relocating any fixed objects (i.e. mailboxes and street signs) and flattening the outside shoulder slope to 6:1. This will require enclosing a portion of the irrigation ditch that is located west of the curve. The ultimate solution to this problem involves the acquisition of right-of-way and reconstruction of the roadway on a straightened alignment. Planning efforts should be initiated to acquire the necessary right-of-way.

Estimated Cost: **$ 17,400**
Possible Funding Source: County Road Funds, Safety Funds

11. South Third & Tower Ditch Enclosure

Problem: The deep irrigation ditches on both sides of Third Street east of Tower Street constitutes a potential safety problem.

Recommendation: On the north side of Third Street the irrigation ditch should be completely enclosed and the ditch filled flush with the surrounding ground. The guardrail on the northeast corner can then be eliminated. The culvert under Third Street should be extended 50 feet to the southeast and the roadway shoulder flattened to a 6:1 slope.

Estimated Cost: **$ 21,400**

Possible Funding Source: County Road Fund,
County Bridge Fund, STPU

12. Higgins Parking Restrictions (Fourth to Brooks)

Problem: This section of Higgins is 56 feet wide and striped to accommodate four travel lanes with parallel parking on both sides. During peak periods of travel, Higgins becomes very congested, mostly due to the narrow driving lanes and minimal lateral clear distance to parked vehicles.

Recommendation: Restrict parking along both sides of Higgins from Third to Brooks as alternate parking becomes available. This restriction will not only improve the traffic flow characteristics but also provide space for bicycle commuters.

Estimated Cost: **$ 2,600**

Possible Funding Source: State Maintenance Funds

13. Mount/Park/Franklin/Plymouth Intersection Reconstruction

Problem: The unique intersection geometrics at this location were questioned with respect to safety and effectiveness.

Recommendation: This intersection should be reconstructed so Franklin and Plymouth intersect north of Mount to form a "Y" intersection. The south leg of the "Y" intersection should intersect Mount across from the Park Street approach.

Estimated Cost: **$ 15,300**

Possible Funding Source: City

14. South Avenue & Johnson Approach Widening

Problem: Approach traffic on Johnson trying to negotiate this intersection experiences long delays.

Recommendation: Widen the north approach enough to accommodate two approach lanes. Widen the pavement on the west approach of South Avenue enough to provide a 12-foot left-turn bay. Pavement widening should continue to the east over the tracks to provide for the eastbound through traffic movement. This will require relocating the railroad crossing signal and widening the at-grade crossing.

Estimated Cost: **$ 23,000**

Possible Funding Source: County Road Fund

15. Brooks & Harve Parking Restrictions

Problem: Parked vehicles on the north side of Harve, adjacent to the Brooks Street intersection, create a narrow passage for westbound traffic. This tends to slow traffic and cause congestion.

Recommendation: Restrict parking on the north side of Harve within 150 feet of the Brooks Street intersection.

Estimated Cost: **$ 225**
Possible Funding Source: City

16. Reserve & 39th Left Turn Bay

Problem: Left turns from the west approach are difficult to make during peak periods, often causing congestion on 39th.

Recommendation: Widen the south side of 39th Street enough to provide a 50-foot-long, 12-foot-wide left-turn bay on the west approach.

Estimated Cost: **$ 8,000**
Possible Funding Source: STPU, County Road Fund

17. 23rd Avenue Pedestrian/Bicycle Improvements

Problem: The street is approximately 34 feet wide without sidewalks or bicycle lanes. There is a need to provide for pedestrian and bicycle traffic along this corridor.

Recommendation: Provide pedestrian/bicycle facilities along this corridor.

Estimated Cost: **$ 300,000**
Possible Funding Source: City, SID

18. Hillview Way Developer Requirements

Problem: There is a lack of pedestrian and bicyclist facilities along most of Hillview Way.

Recommendation: As this area develops, require developers to provide sidewalks on both sides as well as a roadway width sufficient to provide bicycle lanes on both sides of the travel way.

Estimated Cost: Planning Required
Possible Funding Source: n/a

19. Madison Street River Bridge - South Approach Pedestrian/Bicycle Trail

Problem: Pedestrian/Bicycle access

Recommendation: A 12-foot-wide paved trail for pedestrian/bicycle use should be constructed along the west side of the south bridge approach. The trail should begin at the 5th and Arthur intersection and follow the edge of the right-of-way down towards the river and under the bridge. The trail should extend to the east and connect to the University trail system.

Estimated Cost: **$ 25,000**

Possible Funding Source: City, STPE

20. Dearborn & Garfield Sight Distance Improvements

Problem: Parked vehicles obstruct proper sight distance.

Recommendation: Improve sight distance at intersection. Trim trees, replace existing signs with new 36" Stop signs. Install Stop bars and center lines at the Dearborn approaches. Extend left-turn bays to the intersection of Dearborn by providing a continuous two-way left-turn lane.

Long-Term Improvements: Consider modification of mall entrance. Remove the T-intersection at the loop road and provide for an extended roadway into the mall parking area. A proposed future overpass at Brooks and South Avenue will also change traffic patterns at this location.

Estimated Cost: **$ 3,771**

Possible Funding Source: City

21. Fairview & Garfield Sight Distance Improvements

Problem: Parked cars along Garfield obstruct sight distance from the stopped vehicle position. Eastbound Stop sign on Fairview is partially hidden by curbside trees. Yellow curb only extends 20 feet west of the subject Stop sign.

Recommendation: Improve sight distance at intersection. Trim trees, replace existing 30" Stop sign with a new 36" sign. Visually reinforce the Stop conditions with a Stop bar addition to the westbound approach. Implement left-turn bays on Garfield. Extend left-turn bay to provide a continuous two-way left-turn lane. Convert left-turn bay to left and through movements on Fairview.

Long-Term Improvements: Consider modification of mall entrance. Remove the T-intersection at the loop road.

Estimated Cost: **$ 4,920**

Possible Funding Source: City

22. Florence & Edith Traffic Control

Problem: Disparity in street widths.

Recommendation: Stop signs should be installed on Edith. Restrict uncontrolled parking in the intersection area. Install new curbs with appropriate radii at the northeast corner. Move ladder-type crosswalks to match the new curb sections and the existing pedestrian crossing signs. Reinforce the Stop conditions with center lines and Stop bars.

Long-Term Improvements: Consider general construction of a street section separate from parking within an area surrounding the high school.

Estimated Cost: **$ 4,750**

Possible Funding Source: City

23. Garfield & Ninth Traffic Control

Problem: Low-growing tree vegetation in the southwest corner of the intersection prevents a clear line of vision through the corner of the intersection, and a fence in the northeast corner is more of a distraction than an obstruction. Neither yellow curbs nor parking restriction signs are present.

Recommendation: Install Stop signs on the lower-volume Ninth Street. Yellow curbs should be painted in the intersection area. Review the winter maintenance requirements in this area.

Estimated Project Cost: **$ 595**

Possible Funding Source: City

24. Cooley & Dickens Traffic Control

Problem: A wire fence and bush in the southwest corner constitutes an intrusion into the required sight triangle for this Stop-controlled intersection. Numerous vehicles, which restrict sight distance, are also parked directly behind the curb in the northwest corner of the intersection. Vehicles park too close to the Stop signs.

Recommendation: Parking restrictions on Cooley should be marked consistent with vehicle approach speeds at the intersection. No Parking signs should be installed 30' in front of Stop signs. Replace 30" Stop signs with new 36" signs. Re-stripe Cooley with a double yellow centerline.

Estimated Cost: **$ 900**

Possible Funding Source: City

25. Garfield & Fourth Traffic Control

Problem: A fence and trees in the northwest corner of the intersection severely restrict sight distance. Cars park too close to the cross-streets in the southwest corner of the intersection.

Recommendation: Install Stop signs on Fourth. Trim trees, and mark appropriate no-parking zones in the intersection area.

Estimated Cost: **$ 595**

Possible Funding Source: City

26. Fairview & Washburn Traffic Control

Problem: A building in the northwest corner of the intersection, along with landscaping partially block the line of site to the west on the southbound Washburn approach. Parked cars and delivery trucks also obscure vision.

Recommendation: Replace 30" Stop signs with 36" signs. Install Stop bars and parking restriction signs. Extend the curb 25 feet back from the intersection and paint it yellow.

Long-Term Improvements: Depend on improvements made to Brooks Street.

Estimated Cost: **$ 1,155**
Possible Funding Source: City

27. Chestnut & Third Traffic Control

Problem: Drivers over-drive the intersection. Lack of Stop sign visibility due to growing trees.

Recommendation: Trim trees, and replace the Stop signs with 36" oversized signs at a location nearer the intersection. Extend parking restrictions on Third. Prohibit parking at least 90 feet back from the corner radius.

Estimated Cost: **$ 880**
Possible Funding Source: City

28. Front & Pattee Traffic Control

Problem: Street widths and angle parking cause most of the operational problems. Stop signs on Pattee are not entirely visible due to the location and parking conditions. Sight distance for stopped vehicles is inhibited.

Recommendation: Install sidewalk/curb bulbs at the intersection. Install Turn Prohibition and One-Way signs, provide proper pavement markings, and move the Front Street centerline south.

Long-Term Improvements: If traffic volumes increase significantly over existing levels, a traffic signal may be warranted.

Estimated Cost: **$ 8,900**
Possible Funding Source: City

29. Main & Ryman Traffic Control

Problem: Street widths and angle parking cause most of the operational problems. Stop signs are not visible. Parking conditions along Main result in minimal sight distance. Pedestrian crossing during peak hours is impossible.

Recommendation: Install sidewalk/curb bulbs at the intersection. Install Turn Prohibition and One-Way signs, and provide proper pavement markings - especially the solid lane line divider on the Main Street approach.

Long-Term Improvements: If traffic volumes increase significantly over existing levels, a traffic signal may be warranted.

Estimated Cost: **$ 10,900**
Possible Funding Source: City, MRA

30. Cottonwood & Third Traffic Control

Problem: As is typical with this situation, drivers on Third tend to drive with most of their attention focused on the signal ahead, and over-drive the intersection immediately ahead. Stop sign visibility is restricted in the northbound direction by low-growing trees and parked cars. Stop signs are located too far back from the intersection.

Recommendation: Trim trees and relocate the Stop signs closer to the intersection. Fill the pie-shaped areas behind the curb radii with concrete sidewalk. Establish a pedestrian crossing on Third. Mark a left-turn bay for westbound traffic. Eliminate all parking between Cottonwood and Orange, and 100 feet west of the intersection. (This project has been completed.)

Estimated Cost: **$ 4,785**
Possible Funding Source: City

31. Cottonwood & Sixth Traffic Control

Problem: Stop signs are located too far from the intersection throat, and there is only one sign for each direction of side street traffic indicating that Sixth is a one-way street.

Recommendation: Install a new Right-Turn sign on the signal mast arm for southbound traffic. Turn Restriction signs and additional One-Way signs should be installed at the Cottonwood intersection. Relocate the Stop signs nearer to the intersection and mark a solid lane line on the intersection approach.

Estimated Cost: **$ 1,021**
Possible Funding Source: City

32. Mount & Cleveland Access Limitations

Problem: Vehicles turning from Russell onto Mount cannot be observed from the Cleveland approaches until the vehicles are 120 feet away, which is inadequate for non-conflicting access maneuvers. In addition, traffic queued on Mount waiting for the signal effectively blocks sight distance for certain maneuvers.

Recommendation: Limit access to and from Cleveland and the convenience store with pavement markings. Utilize regulatory signs prohibiting turns from the convenience store. Restrict southbound traffic to right turns only. Prohibit left turns for eastbound traffic.

Long-Term Improvements: Modification to the convenience store lot to eliminate the Mount Street access.

Estimated Cost: **$ 1,590**

Possible Funding Source: City

33. Kent & Oxford Traffic Control

Problem: The only legs of this intersection with defined street limits are on the east and north approaches. All other approaches to this intersection appear to be part of the parking lot. Sight distance from the stopped position is impaired by parked cars, especially in the northwest corner where perpendicular parking is allowed up to the curb radius.

Recommendation: Install a curbed island on the southwest corner, and a sidewalk bulb island in the northwest corner. Double yellow center lines, Stop bars and pedestrian crosswalks should be added to all legs of the intersection. Stop signs should be replaced with oversized 36" signs and located nearer to the intersection.

Long-Term Improvements: Consider complete access control to the adjacent businesses.

Estimated Cost: **$ 7,725**

Possible Funding Source: City

34. Myrtle & Fourth Traffic Control

Problem: An initial and lasting impression of this intersection is that the Stop signs are on the wrong street. The line of sight to the Stop signs is impeded by parked vehicles. Angle parking on the east approach provides the greatest sight obstruction. The westbound Stop sign is damaged and faded. Angle parking on Myrtle also restricts the required line of sight from the stopped position.

Recommendation: Modify the intersection corner to provide a curb bulb and sidewalk island.

Long-Term Improvements: Modify parking.

Estimated Cost: **$ 6,670**

Possible Funding Source: City

35. Phillips & Cowper Traffic Control

Problem: Sight distance restrictions at this intersection involve a vertical curve on Cowper, midblock south of the intersection, and the presence of parking on Phillips. Both of the Stop signs at this intersection are damaged. Pavement markings consist of a dashed yellow centerline on Phillips.

Recommendation: Replace existing Stop signs with oversized 36" signs. Install No Parking signs and curb markings on all legs. Change dashed centerline striping to standard urban condition markings.

Estimated Cost: **$ 1,200**

Possible Funding Source: City

36. Arthur & Beckwith Traffic Control

Problem: Trees obscure vision. A left-turn bay on the east approach is not matched by a turn bay on the west approach, causing a centerline offset which makes it difficult for eastbound left-turning drivers to see westbound thru traffic when an opposing left-turn vehicle is in the bay. A depressed drainage inlet in the southeast corner of the intersection tends to slow heavy right-turn traffic movements on the northbound approach.

Recommendation: Trim trees to allow 250 feet of sight distance to the signal heads. Replace signal heads with new 12"x12"x12" mastarm-mounted indications and new 12"x8"x8" pole-mounted heads. Mark the eastbound approach to include an opposing left-turn bay. Widen the street to provide a northbound right-turn lane, and eliminate the depressed drainage inlet.

Estimated Cost: **$ 21,990**
Possible Funding Source: City

37. Spruce & McCormick Curb and Sidewalk Reconstruction

Problem: Stop signs are located behind the sidewalk at a distance of 40 feet from the intersection curb line. Parking setbacks from the Stop signs are only 20 feet.

Recommendation: Move the curb line on Spruce Street six feet toward the centerline on each approach, for a minimum distance of 40 feet back from the intersection. Reconstruct the sidewalks to the new curb radius points. Install crosswalk markings and signs on Spruce Street.

Estimated Cost: **$ 7,845**
Possible Funding Source: City

38. Liberty/Riverfront Trail

Problem: There is a need for a nonmotorized trail along the riverfront.

Recommendation: Construct a nonmotorized trail.

Estimated Cost: **$ 85,500**
Possible Funding Source: City, Private

Appendix C Summary of Public Comments on the Plan Draft

Two Draft Review Workshops and two Public Hearings were held after the draft of this document was produced. The following is a summary of the types of comments received from the general public at these events:

Growth

- Growth is causing most of the problems. Growth is not always a good thing.
- Urban sprawl should be discouraged, particularly west of Reserve.
- Infill development within the urban area should not occur.

Parking

- There is opposition to the removal of parking spaces on Higgins Avenue.
- Truck parking is not adequate in the downtown area. The spaces are too few and too short.
- Change the financing of the leased parking lots downtown. The lease rate should be lower for car pools and higher for single occupant vehicles.
- There should be a charge for parking - this is the single most effective TDM measure identified.

Bicycle and Pedestrian Facilities

- Paved alleys should be used for bike paths.
- There are frequent close calls between bikes and automobiles in many locations.
- As a biker, I'd rather have the parking than bike lanes and faster traffic.
- Reduce the amount of asphalt on arterials and build neighborhood sidewalks or parallel paths. Bike paths on wide streets are useless.
- There should be a bike route parallel to Phillips.
- The 5th/6th Street couplet is not an appropriate place for bike lanes. Other streets in the area such as Blaine and Connell would be better.
- 5th and 6th Streets are poor choices for an east-west bike route due to safety issues (including truck traffic, air quality, speed, road conditions, and traffic volume) and residential parking needs.
- There is a desire for bike routes parallel to 5th/6th Streets rather than on them.
- There is no good east-west bike route. Spurgin might be a possibility. Busy streets are not good options for bike routes.
- It's definitely not safe riding a bicycle on Reserve Street with fast-moving cars.
- Secondary streets should be used as bike routes rather than taking parking from small businesses.
- Consider bike lanes on Park Street instead of on Higgins Avenue.
- It's unclear why we need bike lanes in the South Higgins area, even on Gerald Avenue as an alternate, with the small number of bicyclists there.

- Rather than adding a third lane on Higgins, re-stripe two lanes, leaving 13' on each side of the road to be shared by bikes and parking.
- Taxpayers should not have to pay for biking facilities that such a small segment of the population will use.
- Car projects have more priority than bike projects. Most bike trails that have priority in this Plan will go in as part of road widening efforts for cars.
- There is a need for more pedestrian facilities within the City.
- Don't install sidewalk on the north side of Mount between Hill and Blaine.
- The existing sidewalks are in very poor repair. Example: sidewalks on Brooks Street.
- Rebuild old sidewalks that are in disrepair before installing new sidewalks.
- Install sidewalk on the south edge of the Rose Garden on the north side of Blaine. Add wheelchair ramps at the intersection of Mount and Blaine.
- Sidewalks should be required on only one side of the street, not both sides.
- Owners of six six-plexes on S.W. Higgins who have already agreed to pay for sidewalks should do so rather than taking the funds from CMAQ.
- A second pedestrian crossing of the railroad to the north side is a waste of money.
- At-grade ped/bike crossings should be allowed at the railroad tracks.
- A bike/ped connection is shown on Hilda between 4th and 5th. There is not currently a road there.
- A bike/ped connection is needed between Rollins and Oxford near Mount.
- Peds/bikes need to be separated from cars where possible.
- Add more signals to allow for safer ped/bike crossings.
- There is no one in charge of ped/bike projects because the coordinator's position is vacant and there is a hiring freeze.
- $240,000 of bike/ped money is being spent on tree planting on North Reserve. It is not clear why a beautification project is considered a bike/ped project.
- $38,000 is being spent on historical markers. Money allocated for bike/ped projects should be spent in such a way as to add bike and walking trails, not historical markers.
- An additional $38,000 is being spent on replacement trees in various city locations. Replacement of trees doesn't seem like a bike/ped project.
- There is $5 million being allocated to put in 3.5 miles of bike/ped trails on North Reserve. The budget for this trail project is more than the whole budget for the master sidewalk plan for the entire City and the bicycle commuter network plan of $622,000. These 3.5 miles of bike/ped trail seem inordinately expensive. Some analysis and public discussion of the project list needs to be done because it obviously needs more study.
- Alternative transportation should continue to be promoted.
- The alternative transportation part of this Plan is very out of balance both in emphasis and expenditure. It doesn't seem like 23% of the resources should be spent to benefit approximately 5% of the public.

Street Widening

- There should not be two-way left turn lanes anywhere.
- Increase TDM rather than widening any streets.
- Higgins will be difficult for pedestrians to cross if it is a 5-lane or 3-lane street.
- Broadway does not need to be widened between Flynn and the airport, especially if an interchange is added. Projected traffic volumes don't seem to necessitate widening of Broadway.
- By adding lanes, you effectively reduce the number of potential pedestrians and bicyclists.

Traffic Speeds

- Increasing traffic speeds is counter-productive.
- Speeds need to be reduced on Mount. It is not safe for peds/bikes.

Traffic Signals

- Left turn lanes and protected signal phases are needed on Orange and Broadway.
- There are too many signals and access points on Reserve Street.

Transit Service

- Appropriate more money to improve bus service. Provide more buses, more locations, and more frequent service.
- 31% of the survey respondents said they would ride the bus 2 to 5 days a week if the bus service were reliable and convenient. This Plan does nothing to add new buses or improve routes.
- There is a plan to expend large sums of money to build a downtown passenger terminal and an off street transit facility. Such facilities are not needed. Instead, provide more frequent bus service.
- The Plan needs more transit options, especially intermodal (to airport, etc.) and special needs (Aging Services Senior van doesn't meet community needs).
- A Grant Creek Route should be added to the Mountain Line system, as well as increased service to the South Hills and Fairviews.

Rail Service

- The Transportation Plan does not provide adequate information on rail service.
- Look at rail service, light rail service, rail service between Missoula and the Bitterroot Valley, and working with Montana Rail Link.

North Russell Street Area

- Any development or new access in the area of North Russell should be compatible with the existing west-side and north-side neighborhoods.
- Rezone N. Russell area for homes and open space.

- Consider making the N. Russell area a multi-use area--some commercial, some housing, some open space.
- Build the N. Russell overpass but not the I-90 Interchange.
- Consider an underpass on N. Russell instead of an overpass.
- Remove the Russell Street overpass from the Plan.
- If N. Russell goes through, studies should be done to document any increase in traffic and to determine appropriate traffic calming solutions.
- If Russell Street is widened to four lanes all the way to I-90, the area will develop into warehouses and strip malls and make the land values too high to make affordable housing feasible.
- A Russell Street interchange will inject additional traffic into Malfunction/Junction and the Reserve Street commercial strip.

Other Specific Locations

- The Brooks-South-Russell project has been put on the back burner. Consider moving traffic efficiently through the intersection--not bringing in more traffic, but moving it through.
- Maintain the Brooks-South-Russell project in the Plan.
- Specify a pedestrian project along Brooks Street, the busiest commercial route.
- The interchange near the airport is appropriate.
- Remove the eight-foot apron and move the curb back to the existing sidewalk when modifying the Higgins-Beckwith intersection.
- Consider a traffic plan for the University area that is more inclusive than at present.
- The Plan doesn't consider the traffic that will be produced by the University Family Housing Project.

Neighborhoods

- Don't change the character of historic neighborhoods such as North Higgins and the south side.
- More resources and emphasis should be placed on traffic calming devices in residential neighborhoods.

Transportation Management Association (TMA)

- Find financing to implement a TMA program.
- ISTEA requires expenditure of a certain percentage of money on TMA projects. The Plan needs to ensure that this happens.

Transportation Demand Management

- We would really like to see a more aggressive approach to traffic demand management.
- If we don't actively do something about TDM we're just going to be building more, bigger, efficient highways.

- There is no one in charge of designing transportation demand management projects that will get people out of their autos. No one is hired for this position and it is not listed as a priority in the project list.
- The view of the public were largely ignored. The citizens asked for incentives and disincentives to get people out of their autos and using other modes of transportation. There is no incentive to get out of your car in this current Plan.
- The land use controls in the TDM section of the Plan should include the importance of minimizing hillside development for air quality and TDM reasons.

Public Involvement

- There isn't much public input. The public input was ignored.
- We need to do better in public involvement than now.
- It would be courteous to let the public speak first at the meetings so they can go to work.
- Put together a 15 to 20 page summary document that explains the key components of this Plan and gives an intelligible list of the projects. The summary should be written by a qualified technical writer, and it should be keyed to the larger document so you can look up the technical information you need. The summary should be made available, free, to citizens and neighborhood associations to enable meaningful public discussion.

General

- Logging trucks and through trucks should be kept out of town and off of Mount.
- More money should be directed to programs.
- Maintenance of the new facilities will keep our children in debt.
- The Plan should include discussion about the long term cost of operating and maintaining the proposed transportation system.
- Consider ease of postal delivery in plan recommendations. Replacing parking spaces with bicycle lanes, for instance, makes it more difficult for the Postal Service to deliver mail.
- Alleys should be tow-away zones with fines.
- The hearing was not announced in the *Missoulian* on the day of the hearing.
- We want a transportation plan that uses some of the land use planning ideas the City of Portland has adopted in its transportation plan. We would like to have Missoula's Transportation Plan evaluated by one of their engineers.
- Transportation planning and land-use planning should be more aggressively integrated. If neighborhoods like Miller Creek are built with no services, residents will be totally car-dependent.
- We have been led to believe that if we delay passage of the Plan for more public input, we will jeopardize Federal funding for projects. However, the Federal Transit Administration Office in Denver said this is not the case. Our funding will merely be delayed. We would not lose it.
- Developers rather than taxpayers should assume the financial burden of improving facilities to meet the traffic demands caused by commercial and residential development.

- Model air quality not on the SIP level that's required, but on the cleaner air that we currently have.
- Everyone who worked on the Transportation Plan should read *Geography of Nowhere* by James Kunstler. The author stated that as we change our transportation system to accommodate bicycles and pedestrians, we need to change our building codes as well.
- The Plan should not be limited to a finite time period or study area, but should speak to long range aspects of transportation. Section 14.2 should be expanded to include more information regarding right-of-way acquisition. Problem areas that are expected to arise in the future should be identified, including those that will occur beyond 2015 or outside the study area.
- Enforce people to keep their cars running properly, or take them off the road.
- All vehicles should be tested annually for auto emissions.
- Research and discussion are promised on a project by project basis prior to any implementation. It seems like the end product will be fragmented when it is discovered that some aspects are workable and others are not.

Appendix D Air Quality Conformity Determination

D.1 Introduction and Summary

D.1.1 Background

The Federal Clean Air Act of 1970 established National air quality standards for six pollutants. The Act required states exceeding the standards to prepare air quality plans showing how the standards were to be met by 1987. The Act was amended in 1977, and again in 1990, to extend the deadline for compliance and require that revised State Implementation Plans (SIP) be prepared. The SIP is the strategy by which the air quality standards will be eventually attained.

The 1990 Clean Air Amendments included provisions designed to ensure that federal agencies contribute to, instead of jeopardizing, efforts to achieve the air quality standards. In November of 1993 the U. S. Environmental Protection Agency (USEPA), issued regulations implementing the conformity provisions of 1990 Clean Air Act Amendments. Separate rules were developed for transportation projects/plans (Transportation Conformity Rule) and other federal actions (General Conformity Rule). It is the Transportation Conformity Rule that the Missoula Transportation Plan must meet, and demonstrating that the Missoula Transportation meets these requirements is the purpose of this air quality analysis.

D.1.2 Nonattainment Pollutants

Based on air pollution monitoring data Missoula has been designated as "nonattainment" (the standards are not attained) for two pollutants: carbon monoxide and PM_{10}. These two pollutants are quite different, and the official boundaries of the "nonattainment areas" for the two pollutants vary as well. **FIGURES D-1** and **D-2** delineate the "nonattainment areas" for carbon monoxide and PM_{10}.

Carbon Monoxide

Carbon monoxide (CO) is an odorless, colorless gas created by the incomplete combustion of fuels. Its major source in Missoula is automobile exhaust. High concentrations of carbon monoxide in Missoula are a wintertime phenomena. This is because vehicles produce more carbon monoxide as temperature decreases, and the dispersion of carbon monoxide is least during light wind and inversion conditions[1] that typically occur in winter in Missoula.

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[1] An atmospheric condition where temperature increases with height above the ground. Under these conditions vertical mixing of pollutants is suppressed, trapping pollutants within a shallow layer of air near the ground. In Missoula, the rapid cooling of the ground after sunset creates a ground-based inversion on calm, clear winter nights.

Since carbon monoxide's major source is vehicle exhaust, higher concentrations of this pollutant will be found near major roadways. Since the emission rate from vehicles increases as average speed goes down, the highest concentrations of carbon monoxide will be found near congested intersections. Although violations of the air quality standards in Missoula have been found only in a limited area in the vicinity of the South/Brooks/Russell intersection, the official nonattainment area includes all of Missoula and parts of neighboring urbanized Missoula County.

It is important to note that during the past three years Missoula has been running just one-and-one-half to two parts per million below the CO standard. This is not an adequate buffer to insure continued compliance with the standard. Missoula could violate the standard at the South/Brooks/Russell intersection under several different sets of circumstances:

1) An interruption in the supply of oxygenate to Missoula;

2) Coincidence of very poor dispersion (a long inversion), high traffic day (Friday or Saturday), and higher than normal wood burning (a holiday);

3) Either high traffic or high wood burning in 2) above could be substituted with very cold weather which results in a long cold start and CO emissions much higher than normal.

During 1995 Missoula experienced a 7.8 PPM event day. This is just 1.2 PPM below the standard. This occurred on Thanksgiving day when conditions were similar to those listed in 2) above, although the dispersion was not as bad as it could have been. Sixteen hours of somewhat worse conditions would likely have caused a violation.

The point is that the community should not base the Transportation Plan on the assumption that Missoula will continue to comply with the CO standard at the South/Brooks/Russell intersection. The margin for error is very small and could with coincident conditions, result in a violation. Growth in average daily traffic will also have an adverse impact on congestion and air quality. If Missoula violates the CO standard, the Plan conformance will also be violated. These facts indicate that it is important to continue to pursue a viable and permanent solution at the South/Brooks/Russell intersection.

PM_{10}

PM_{10} is shorthand notation for Particulate Matter of less than 10 microns[2] in diameter. Also known as suspended particulate matter or fine particulate matter, PM_{10} consists of a wide range of solid or liquid particles small enough to remain suspended in the atmosphere. There are many sources of

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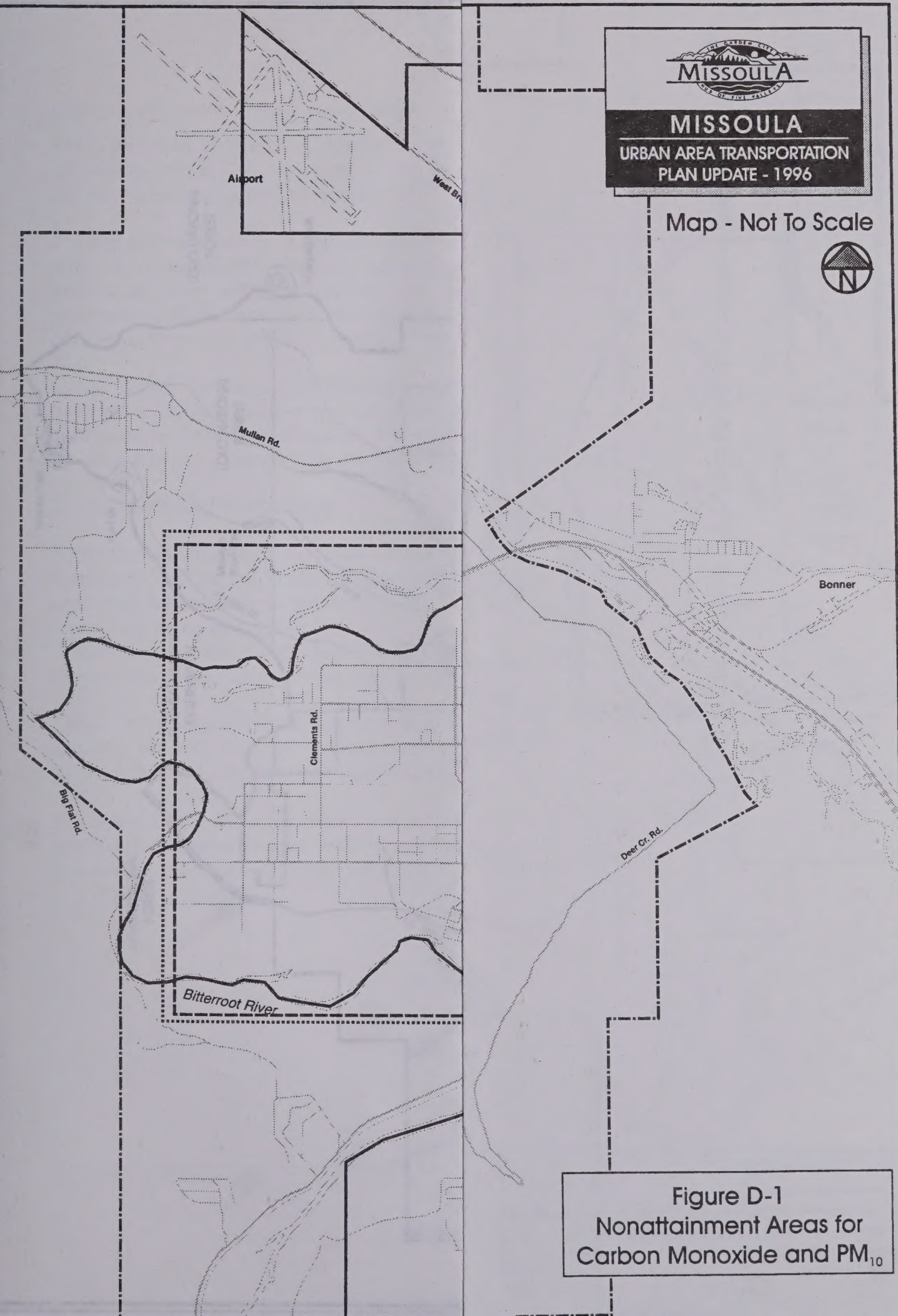
[2] A micron is one millionth of a meter or roughly 0.00004 inches.



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Map - Not To Scale

Figure D-1
Nonattainment Areas for Carbon Monoxide and PM$_{10}$

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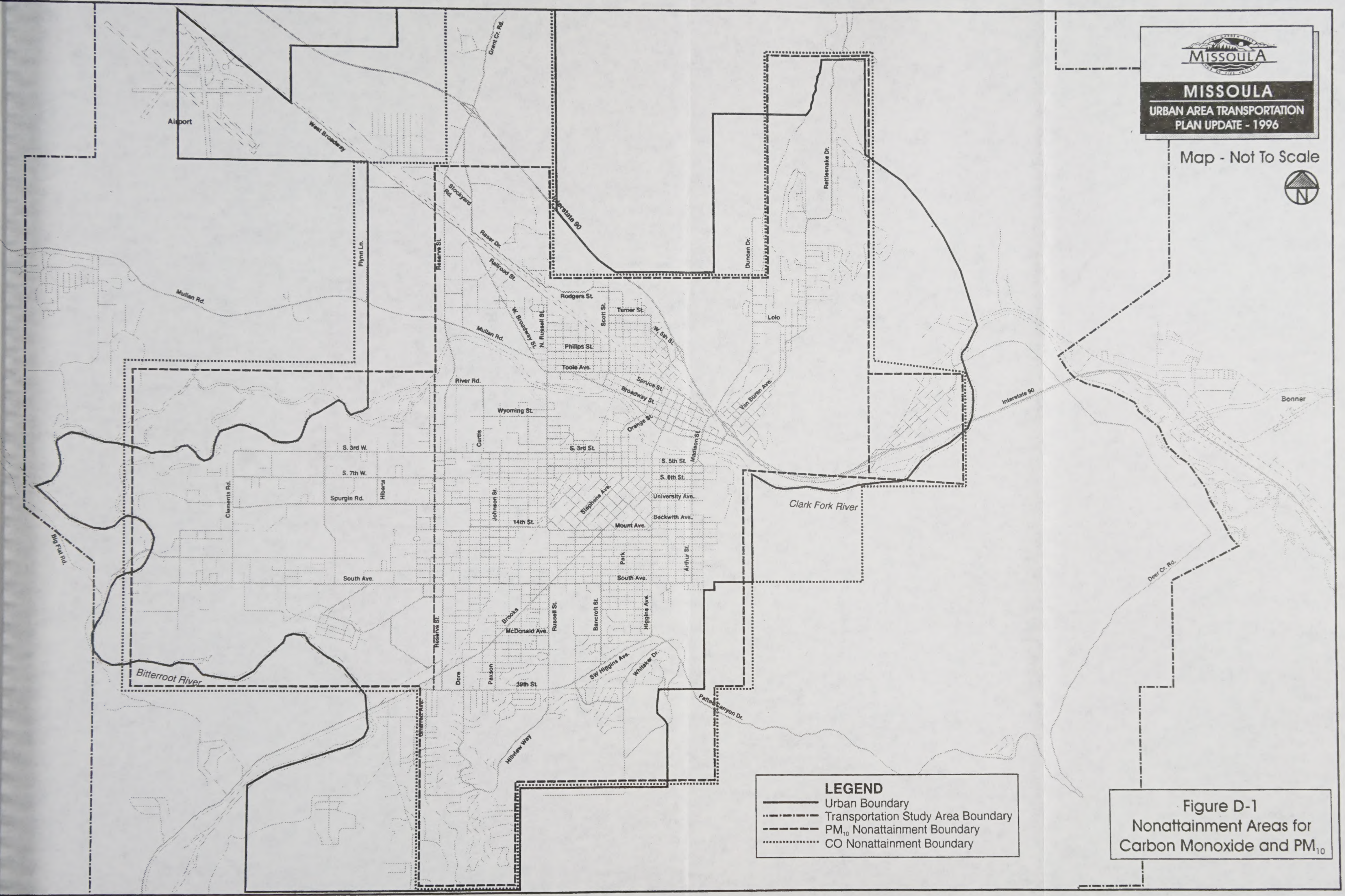

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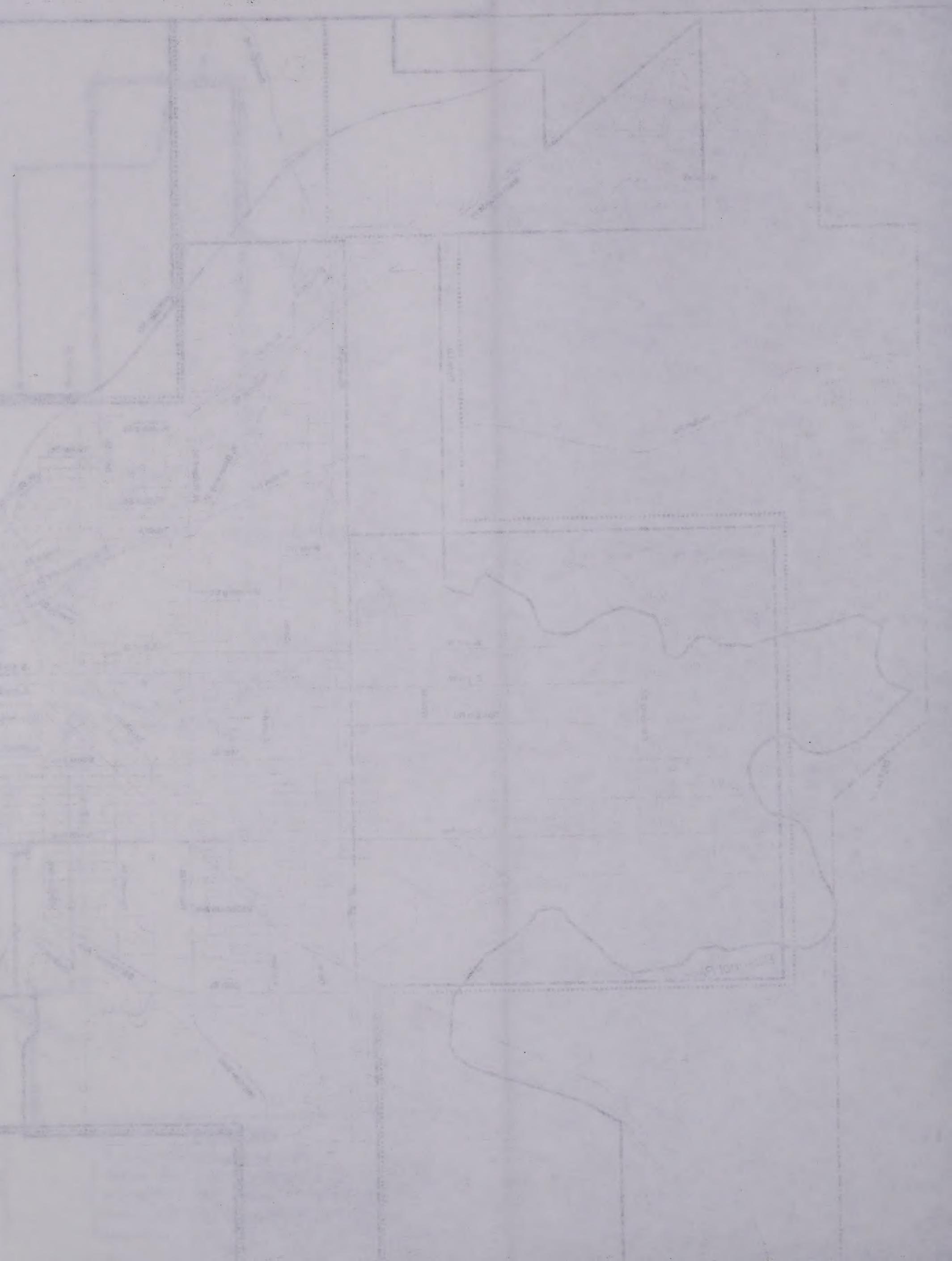
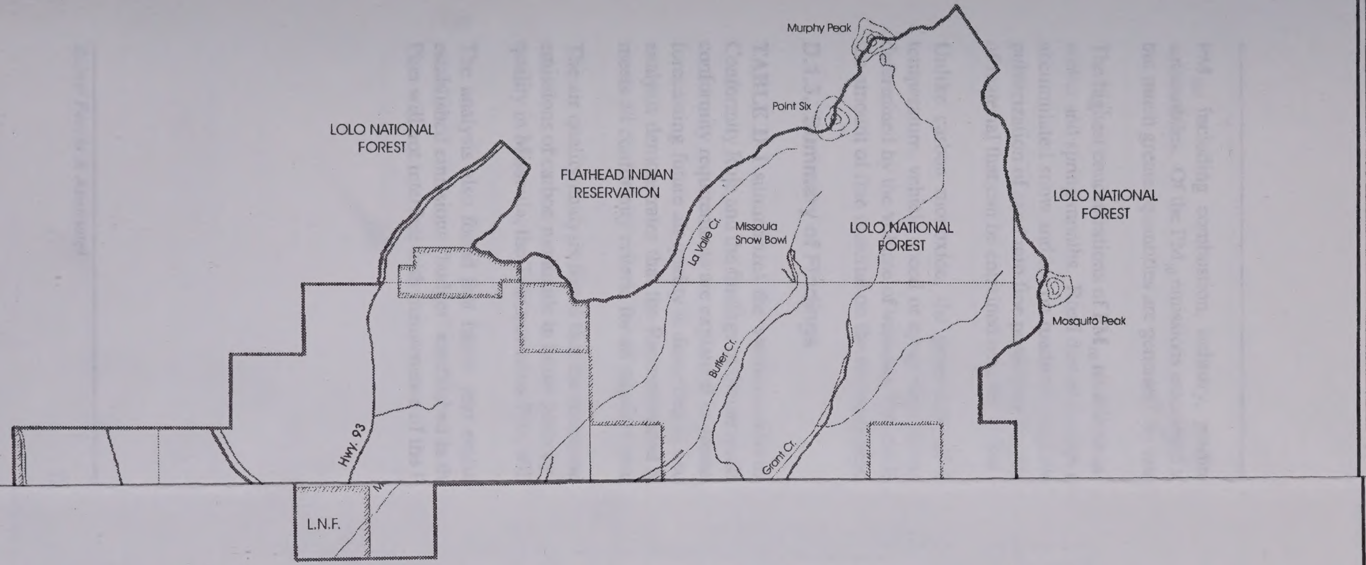
Figure D-1
Nonattainment Areas for
Carbon Monoxide and PM_{10}





Nonattainment Areas For Carbon Monoxide and PM_{10}

LEGEND

- ——— Urban Boundary
- -·-·-·- Transportation Study Area Boundary
- - - - - PM_{10} Nonattainment Boundary
- ········ CO Nonattainment Boundary

Map - Not To Scale

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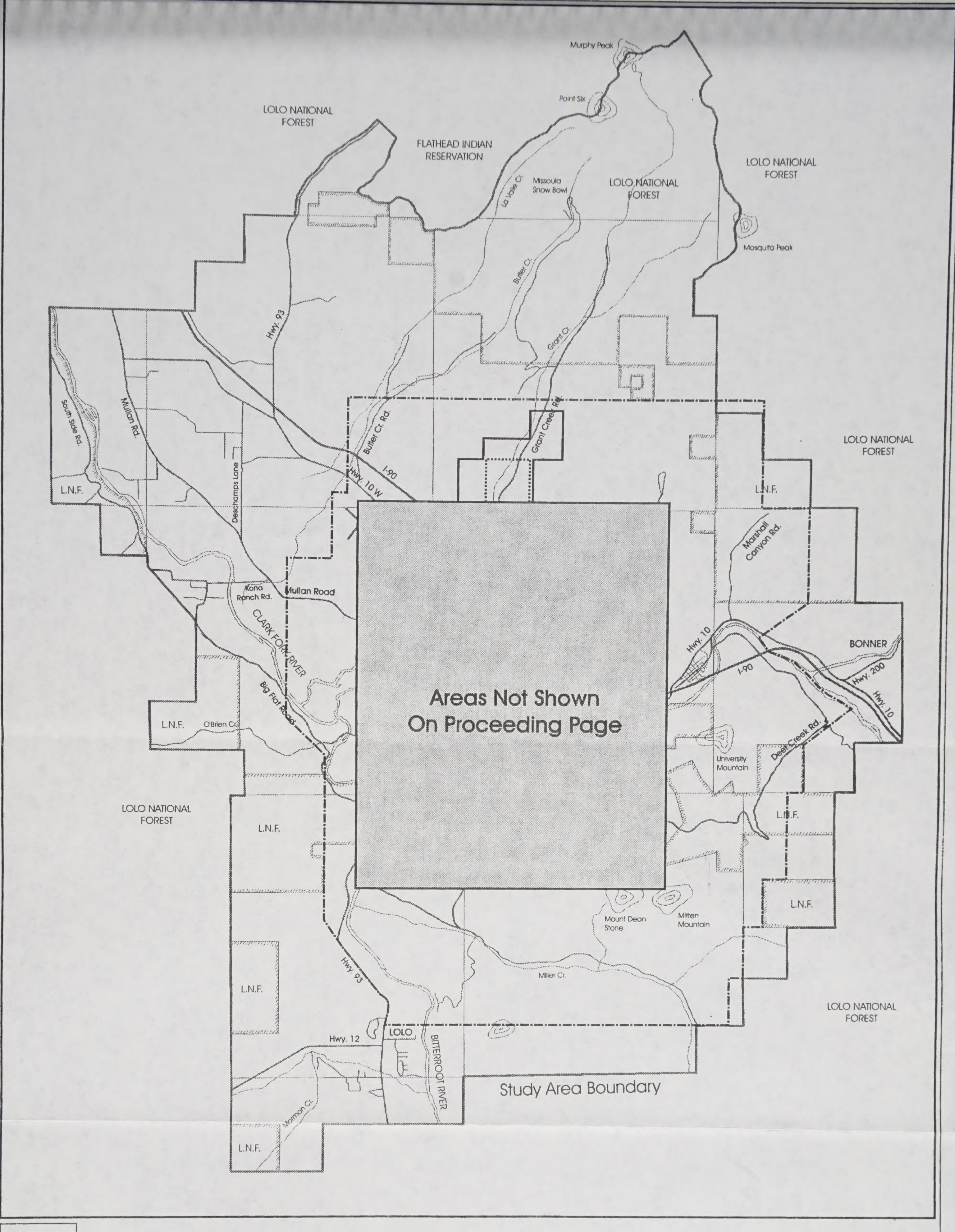
Figure D-2
Nonattainment Areas for
Carbon Monoxide and PM_{10}



Nonattainment Areas For Carbon Monoxide and PM_{10}

LEGEND
Urban Boundary
Transportation Study Area Boundary
PM_{10} Nonattainment Boundary
CO Nonattainment Boundary

Map - Not To Scale

N

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Figure D-2
Nonattainment Areas for
Carbon Monoxide and PM_{10}

PM_{10}, including combustion, industry, grading and construction, wind erosion of soils and automobiles. Of the PM_{10} emissions associated with motor vehicles some are tailpipe and tire wear, but much greater quantities are generated by resuspended road dust.

The highest concentrations of PM_{10} measured in the atmosphere of Missoula typically occur in the winter and spring months. Road dust emissions reach a maximum after warming temperatures melt accumulated snow and ice on roadways, and the accumulated dust from road sanding dries. The pulverization of sand into fine particulate by passing vehicles continuously replenishes the supply of material that can be entrained into the wakes of passing vehicles.

Unlike carbon monoxide, the generation of PM_{10} by automobiles is not greatly affected by temperature, vehicle speed or congestion levels. The generation of PM_{10} by vehicles is directly determined by the volume of vehicles, the condition of the roadway surface (icy, wet, or dry) and the amount of fine material on the roadway (known as the silt loading).

D.1.3. Summary of Findings

TABLE D-1 summarizes the various conformity requirements contained in the Transportation Conformity Rule and the findings of the air quality analysis with respect to each requirement. The conformity requirements are explained in greater detail in Section D.2. The methodology used in forecasting future air quality is described in Section D.3. **TABLE D-1** shows that the air quality analysis demonstrates that the Recommended Missoula Urban Transportation Plan 1996 Update meets all conformity criteria for all required analysis years.

The air quality analysis found that the recommended projects contained in the Plan will decrease emissions of carbon monoxide in future years by reducing traffic congestion. In terms of future air quality in Missoula, the Transportation Plan will result in lower carbon monoxide concentrations.

The analysis also found that future year emissions of PM_{10} from vehicles will not exceed the established emissions "budget" established in the State Implementation Plan. The Transportation Plan will not interfere with maintenance of the PM_{10} air quality standards through the year 2015.

TABLE D-1
Summary of Air Quality Analysis Findings with Respect to Conformity Criteria

Pollutant	Required Analysis Year	Criterion	Criterion Met?
PM-10	**1998**	Predicted Emissions Below Budget Established in SIP	Yes (See **TABLE D-7**)
	2005		Yes (See **TABLE D-7**)
	2015		Yes (See **TABLE D-7**)
Carbon Monoxide	**2005**	Predicted Emissions Below 1990 Emissions	Yes (See **TABLE D-4**)
	2015		Yes (See **TABLE D-4**)
	2005	Projects Result in a Reduction in Emissions	Yes (See **TABLES D-3 & D-4**)
	2015		Yes (See **TABLES D-3 & D-4**)

D.2 Conformity Requirements

The SIP analyses for Missoula for carbon monoxide and PM_{10} are based on inventories of all known sources within each of the nonattainment areas. The basic requirement of the Transportation Conformity Rule[3] and recent amendments[4] is that transportation-related sources within this inventory be recalculated for the nonattainment area as a whole with the proposed project in place. The Rule provides for specific years that the analysis is to be performed, and the forecast inventory is to subjected to specific criteria that must be met to demonstrate that the project conforms.

The Missoula Transportation Plan consists of numerous projects and programs to improve transportation in Missoula. Regionally significant Plan elements were identified to be input into the transportation model for each analysis year. **TABLE D-2** summarizes the regionally significant network modifications assumed in each model run.

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[3] 40 CFR, Part 93, Criteria and Procedures for Determining Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Funded or Approved Under Title 23 U.S.C. or the Federal Transit Act, EPA, November 1993.

[4] 60 FR 40098 and 60 FR 57179

TABLE D-2
Regionally Significant Projects and Programs

Model Run*	Regionally Significant Projects/Programs
Baseline (1994)	None. The roadway network as it existed in December 1994.
1998 No Project	Same as Baseline
1998 Project	Baseline plus the following committed projects: ● Areawide Traffic Signal Project ● North Reserve Street Widening ● Broadway Widening ● Linda Vista Drive Extension**
2005 No Project	Baseline plus the following committed projects: ● I-90 Airport Interchange ● Airport/Mullan Grid Improvements ● Linda Vista Drive Extension**
2005 Project	1998 Project plus 2005 No Project plus the following: ● Brooks/South/Russell Intersection ● Orange Street Bridge ● SW Higgins Widening ● S. 3rd Street Widening ● Russell Street Widening (3rd to River) ● Russell Street Bridge Widening
2015 No Project	Same as 2005 No Project
2015 Project	2005 Project plus the following: ● Higgins/SW Higgins/39th street Widening (South to U.S. 93/39th) ● Russell Street Widening (Mount to River) ● Madison/5th/6th/Maurice/Arthur Improvements ● Johnson Street Extension ● South Avenue Widening ● Mary Street Extension

* No credit has been taken in any model runs for potential benefits derived from the proposed pedestrian, bicycle, transit, and TDM programs included in the Plan.

**The Linda Vista Drive Extension project, which involved extending Linda Vista Drive to connect with Upper Miller Creek Road was funded and completed by the developer in 1995 and is not reflected anywhere else in this document. This link addition was considered to be regionally significant and is included in all model runs for future years 1998, 2005, and 2015.

A transportation model was used to forecast various traffic parameters (volumes of cars, average speed, etc.) for future years both with and without the proposed project. The regionally significant projects and programs within the Missoula Transportation Plan were reflected in the transportation model runs. Conformity of a transportation plan is based on the cumulative and aggregate effect of all plan components[5]. Note that no credit was given in the confomity determination for potential travel reductions resulting from the ped/bike, transit, and TDM programs recommended in the Plan.

Other basic conformity requirements are:

- The conformity analysis must be based on the latest population projections.
- The conformity analysis must use the latest emission factors.
- The conformity process is to involve consultation with the various involved federal, state and local agencies.

The first of the above requirements is reflected in the transportation model, which was based on the latest forecasts population. The second requirement is extremely important for this analysis, since the programs and models that provide emission rates from vehicles have been revised since the SIP analyses for carbon monoxide and PM_{10} had been prepared. The third requirement has been met through extensive coordination and consultation between all involved parties in the development of the air quality analysis methodology. Appendix D1 contains correspondence generated in the development of a "protocol" for this conformity analysis.

The Transportation Conformity Rule is a lengthy, complex document. The conformity criteria and required procedures that demonstrate conformity differ between pollutants and vary with the severity of the air quality problem. The following is a summary of the conformity criteria and procedures contained in the Transportation Conformity Rule that pertain to the Missoula Transportation Plan.

Carbon Monoxide

Inventories for transportation-related sources within the nonattainment area with the project are required for the years 2005 and 2015. The basic conformity requirement is:

- Forecasted emissions with the project are less than forecasted emissions without the project.
- Forecasted emissions with the project in 2005 and 2015 are less than 1990 emissions as calculated in the SIP analysis.

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[5] Projects contained in a conforming plan may be subject to a hot spot analysis (as is the case with the North Reserve Street Project) and therefore be subject to conformity provisions beyond the regional air analysis for the Plan.

PM_{10}

Inventories for the nonattainment area for transportation-related sources with the project are required for the years 1998, 2005 and 2015. The basic conformity requirement is:

- Forecasted emissions within the nonattainment area with the project (and implemented controls) are less than the emissions budget in all analysis years. The emissions budget is 16,119 pounds as established in the SIP analysis.

D.3 Methodology and Analysis

The forecasting of both carbon monoxide and PM_{10} emissions were based on transportation model output. Vehicle Miles Traveled (VMT) and average speed were calculated by the transportation model within the boundaries of the carbon monoxide and PM_{10} nonattainment areas. This model output was combined with emission factors to produce forecasts of future emissions.

Carbon Monoxide

1990 Base Year

The 1990 SIP analysis calculated CO emissions by multiplying VMT by road type by an emission factor reflecting the average speed for each road type. Two separate calculations were made for rural areas and urban areas. The emission factors were generated by the MOBILE4.1 program.

The MOBILE4.1 program used in the 1990 SIP analysis has been superseded by the MOBILE5a program. The 1990 SIP analysis has been repeated using all the same parameters, but using the MOBILE5a program to generate emission factors. Appendix D2 contains the updated MOBILE5a model inputs and output for 1990. Appendix D3 contains the printouts of the spreadsheet used to calculate carbon monoxide emissions. **TABLE D-3** compares the MOBILE4.1 results with those from the MOBILE5a model. VMT and speed parameters in both cases are identical.

TABLE D-3 shows that the 1990 emissions estimated using MOBILE5a are higher than those based on MOBILE4.1. The CO conformity requirements include the demonstration that future CO emissions be less than the 1990 SIP emissions. This demonstration will be based on comparison with the MOBILE5a emission totals rather that the MOBILE4.1 emission totals.

TABLE D-3
Comparison of 1990 CO Emissions for Missoula Nonattainment Area Based on MOBILE4.1 and MOBILE5a, in pounds/day

Model		**Road Classification**				**Total**
		Freeway	**Arterial**	**Collector**	**Local**	
MOBILE4.1	**Urban**	2,824	55,158	11,165	18,220	87,367
	Rural	24,184	22,442	1,312	5,571	53,509
	Total	27,008	77,600	12,477	23,791	**140,876**
MOBILE5a	**Urban**	1,987	81,044	15,902	22,899	121,832
	Rural	29,610	29,675	1,683	6,681	67,649
	Total	31,597	110,719	17,585	29,580	**189,481**

Forecast Years 2005 and 2015

The conformity requirement carbon monoxide is that the project must show a net reduction in emissions and that emissions for each forecast year are less than the 1990 base case. The same basic method used in the SIP analysis was used to project year 2005 and 2015 emissions with and without the project. The traffic model runs produced VMT and average speed by road classification within the CO nonattainment area. Traffic model runs were made for the project and no project scenarios.

The MOBILE5a emission program was used to provide emission rates at the appropriate speeds. The vehicle mix and mileage accumulation rates were updated using 1994 data, and the differentiation between rural and urban roads was dropped. MOBILE5a input and output files are included in Appendix D2.

TABLE D-4 shows forecast carbon monoxide emissions for 2005 and 2015 with and without the project. The calculations of emissions were made using a spreadsheet that multiplied VMT by road type by emission factor at average vehicle speed. The spreadsheet outputs for 2005 and 2015 are included in Appendix D3. The spreadsheet multiplies VMT by road category by an emission factor, then totals over all road categories. A sample printout of the CO spreadsheet showing cell formulas is also provided in Appendix D3.

The emission factors in these spreadsheets come from MOBILE 5a printouts included in Appendix D2. Each MOBILE 5a run contains two scenarios (high altitude and low altitude) for each road type. The high and low altitude runs were averaged to obtain a single emission factor. Appendix D4 provides the transportation model printouts showing the model outputs (VHT, VMT, and vehicle speed) for 2005 and 2015 that provide the inputs to the MOBILE 5a and CO spreadsheet. Average speed for arterials was taken as the average of the average speeds for primary arterials and arterials.

The net effect of project on VMT and average vehicle speed result in emissions that are slightly less than for the no project case. Comparing project results in **TABLE D-4** with the recalculated CO emissions in 1990 shown in **TABLE D-3** (189,481 pounds) reveals that year 2005 and 2015 emissions with the project would be substantially less than 1990 emissions.

TABLE D-4
Comparison of Year 2005 and 2015 CO Emissions for Missoula Nonattainment Area with and without Recommended Missoula Urban Transportation Plan 1996 Update

Year		Road Classification				Total
		Freeway	Arterial	Collector	Local	
2005	**No Project**	2,329	35,210	7,484	9,051	**54,074**
	Project	2,350	34,785	7,557	9,124	**53,816**
2015	**No Project**	2,275	37,554	8,698	10,170	**58,697**
	Project	2,280	36,648	8,589	10,091	**57,608**

PM_{10}

The conformity criteria for a Transportation Plan during the control strategy phase for PM_{10} is that the transportation plan must be consistent with the motor vehicle emissions budget. The current Missoula PM_{10} budget is 16,119 pounds within the nonattainment area.[6] This budget consists of tailpipe emissions of PM_{10} and paved road emissions from vehicles.

Emissions Factors

The SIP analysis of PM_{10} was based on the MOBILE-P emissions factors for auto exhausts and AP-42, Fourth Edition emissions factors for road dust. The Missoula PM_{10} SIP analysis uses the basic AP-42 (Fourth Edition) road dust equation:

$$e = k(sL/0.7)^{0.8}$$

to calculate silt loads for the four road categories and the ultimately the effectiveness of control measures. The SIP PM_{10} inventory analysis did not use actual silt loading data to calculate emission factors, but calculated silt loads by road classification by multiplying AP-42 (Fourth Edition) default emission factors by 4.9 (a factor derived from Chemical Mass Balance analysis of PM-10 samples for winter and spring months) and solving the above equation for "sL".

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[6] Memorandum from Ross Tervo to Gretchen Bennitt dated October 4, 1995.

Since the AP-42 (Fourth Edition) emission factors have been superseded, this methodology was not used for the conformity analysis. The latest version of AP-42 (Fifth Edition) has a completely different formulation for paved road dust:

$$e = k(sL/2)^{0.65}(W/3)^{1.5}$$

where k is a dimensionless multiplier of 0.016, sL is the road surface loading, and W is the mean vehicle weight.

The above equation can provide emission factors if the silt load and vehicle weights are known. The Montana Department of Transportation provided information on average vehicle weights by road classification. The values for Primary Arterials and Minor Arterials were averaged to reach a single value for arterial roads. The resulting average vehicle weights were:

Freeway:	5.2 tons
Arterial:	2.75 tons
Collector:	2.2 tons
Local:	2.0 tons

For several years the Missoula area has had several PM_{10} control programs in place. The use of washed sand for road sanding is required within most of Missoula. Within a smaller area the use of liquid "de-icers" has been required when weather conditions permit since 1992. This same area is subject to enhanced street sweeping during the winter months to reduce silt buildup on the surface of arterial roads. The definition of the "washed sand" and "de-icer" areas is shown in **FIGURE D-3**.

Silt loading data has been collected over a period of years in Missoula. All these measurements were made within the "de-icer" area. All measurements taken after 1991 reflect current control programs (de-icer use when weather permits, washed sand when it does not). Measurements made between 1989 and 1991 reflect the use of washed sand only. The silt loading data from Missoula streets used in calculating PM_{10} road dust emissions are shown in **TABLE D-5**.

Area of De-Icer/Washed Sand

Silt loading data were compiled for the different road types using only springtime data (February-March). The data from 1992-1995 provide a silt loading for areas subject to de-icing. Where multiple measurements were available, the data were averaged. No samples were available for freeways, so a default value of 0.1 grams per square meter was assumed.[7] **TABLE D-6** shows the

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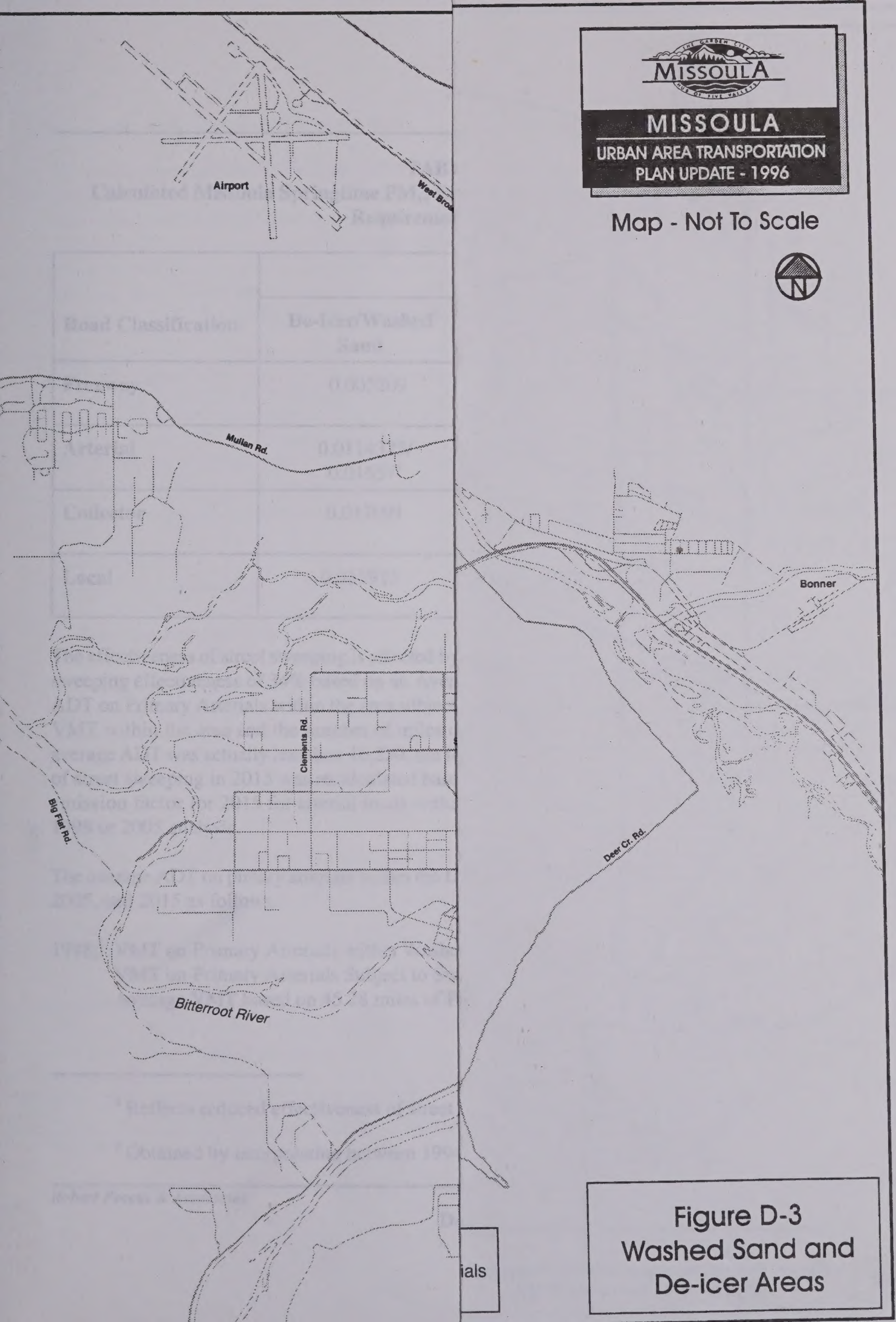
[7] U.S. Environmental Protection Agency, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, AP-42, Fifth Edition, January 1995.



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Map - Not To Scale

Figure D-3
Washed Sand and
De-icer Areas

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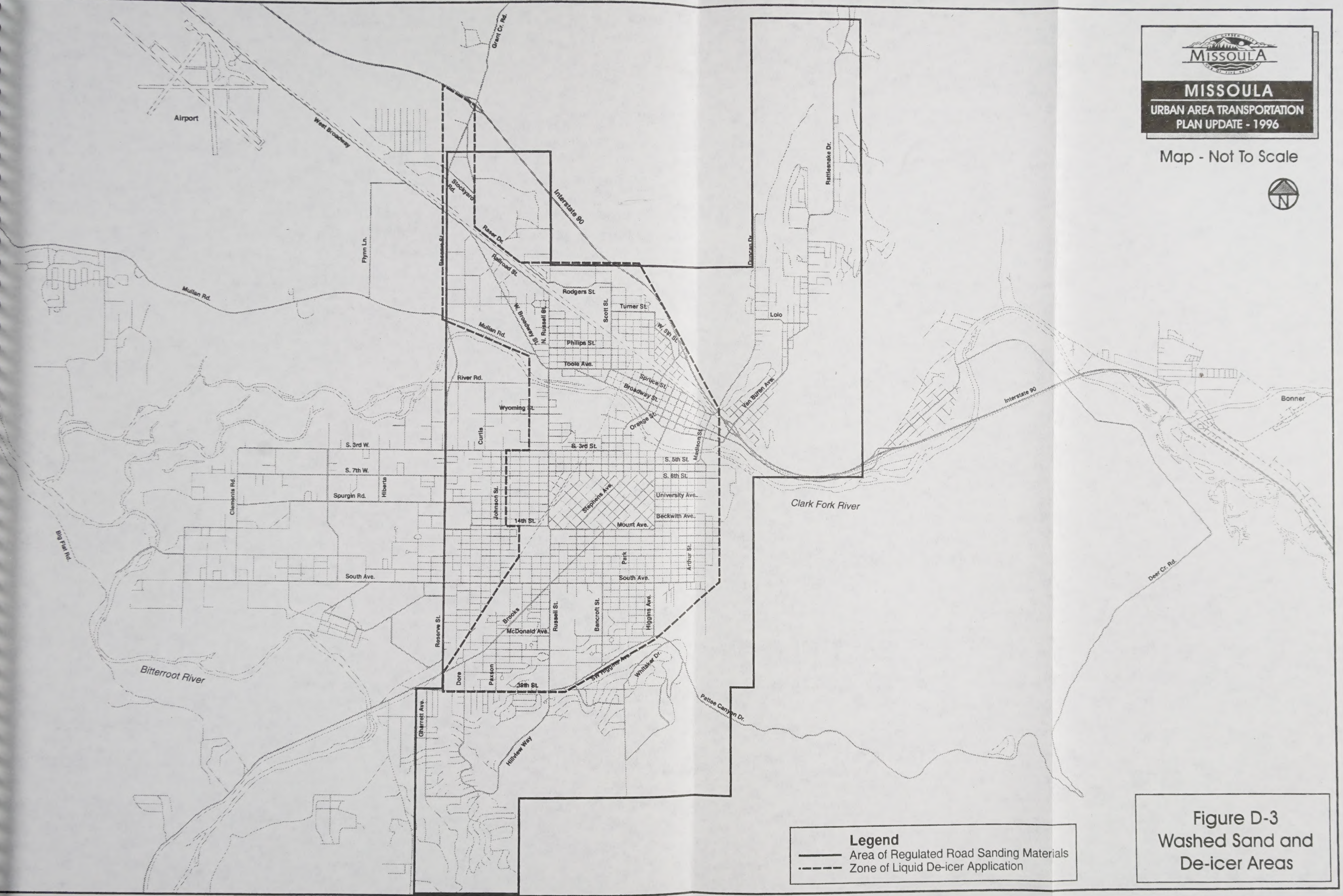

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Map - Not To Scale

Legend

——— Area of Regulated Road Sanding Materials

- - - - - Zone of Liquid De-icer Application

Figure D-3
Washed Sand and
De-icer Areas

TABLE D-6
Calculated Missoula Springtime PM_{10} Emission Factors by Road Type and Control Requirements (lbs/VMT)

Road Classification	**Control Requirement**		
	De-Icer/Washed Sand	**Washed Sand Only**	**No Controls**
Freeway	0.005209	0.005209	0.005209
Arterial	0.0114325/ 0.01657[8]	0.028054	0.039707
Collector	0.017091	0.01525	0.022026
Local	0.015975	0.018361	0.026517

The effectiveness of street sweeping is affected by traffic volumes. The SIP PM_{10} calculated a street-sweeping effectiveness of 34% based on an Average Daily Traffic (ADT) of 10,230. The average ADT on Primary Arterials within the area subject to street sweeping was calculated based upon the VMT within the area and the number of miles of Primary Arterial roads. For 1998 and 2005 the average ADT was actually less than 10,230, but for 2015 it was greater. Therefore, the effectiveness of street sweeping in 2015 was recalculated based on the average ADT on Primary Arterials. The emission factor for 2015 for arterial roads within the de-icer area was slightly higher than for the 1998 or 2005 analysis.

The average ADT on pimary arterials within the De-Icer/Washed Sand Area was calculated for 1998, 2005, and 2015 as follows:

1998:[9] VMT on Primary Arterials within Washed Sand Area = 437,864
VMT on Primary Arterials Subject to Sweeping (90.33%) = 395,523
Average VMT based on 45.28 miles of Primary Arterials = 8,735

---

[8] Reflects reduced effectiveness of street sweeping from 34% to 32.7%..

[9] Obtained by interpolating between 1994 and 2005 model runs.

resulting emission factors for the de-icing area. The effect of street sweeping programs is not reflected in these factors, however. Silt load measurements were supposed to be made before street sweeping occurred. One abnormally low value of silt loading was found to have been taken after sweeping had occurred, and this measurement was discarded.

TABLE D-5
Calculation of Silt Loading by Road Classification

Road Classification	Sample Date	Silt Loading Samples (grams per square meter)	Average (grams per square meter)
Area of Washed Sand and De-Icer			
Local Street	3-11-93	5.0855	5.0855
Collector Street	3-11-93 3-11-93 3-11-93 3-11-93 3-25-94 3-16-95 3-11-93 3-25-93 3-16-95	3.5384 2.3565 6.2277 8.7581 1.3118 1.0640 9.2618 5.4178 2.81964	4.5284
Arterial	3-16-93 3-25-94 3-16-95	5.0952 1.3935 1.7985	2.7624
Freeway	Default	0.1	0.1
Area Of Washed Sand Only			
Local Street	2-28-91	6.3	6.3
Collector Street	2-28-91 2-28-91	4.5 3.1	3.8
Arterial	From Butte, MT 2-21-91 2-02-92	 2.9 8.7	5.8
Freeway	Default	0.1	0.1

of measurements available, it is not unexpected that inconsistencies within the data would exist, particularly since the silt loading measurements show great variance.

The apparent inconsistency may be simply due to the availability of only a single measurement or could be due to factors such as traffic volumes, fraction of truck traffic, adjacent land uses, road sanding practices or street sweeping practices. This single measurement is, however, the only available data so it was used unmodified.

Area of No Controls

No silt loading data were available where no controls (de-icer or washed sand) were in place. Silt loads for these streets were estimated from the 1989-1991 silt load measurements (reflecting the use of washed sand) by increasing the silt load proportionally to the amount of control assumed in the SIP for the use of washed sand. Since the SIP assumed that the use of washed sand would decrease silt loading by 43.2%, dividing the measured "washed sand" silt loads by 0.568 (1 - 0.432) yields an uncontrolled silt loading that is consistent with the measured data and the SIP assumptions.

Freeway

None of the Missoula silt loading data reflect conditions on the interstate. The AP-42 default silt load value for limited access roads after application of snow/ice controls was used as the uncontrolled emission factor for the Interstate in all areas.

Calculation of Emission Factor from Silt Loading Data

TABLE D-6 summarizes the resulting calculation of springtime emission factors by road classification. Appendix D6 includes a printout of the cell formulas within the spreadsheet used to calculate emission factors from silt loadings, followed by the individual spreadsheets showing calculated emission factors by road type.

Tailpipe Emission Factors

The PART5 program was used to predict 1998, 2005 and 2015 exhaust emission factors. Default values for vehicle registration and mileage accumulation were used. The resulting emission factors were 0.124 gram/mile in 1998, 0.095 gram/mile in 2005 and 0.086 gram/mile in 2015. These factors includes exhaust emissions, indirect SO_4 emissions, brake wear emissions and tire wear emissions. The PART5 printouts are included in Appendix D7.

Emission Calculation

The basic approach was to utilize the traffic model to produce VMT by road classification for the PM_{10} nonattainment area broken down into three different categories: de-icer use, washed sand use, and no control. The traffic model directly calculated VMT for the entire nonattainment area and the smaller "washed sand" area. The difference between these two numbers is the amount of VMT on roads with no controls whatsoever. Transportation model outputs used in the analysis of PM_{10} are included in Appendix D4.

2005: VMT on Primary Arterials within Washed Sand Area = 456,641
VMT on Primary Arterials Subject to Sweeping (90.33%) = 412,484
Average VMT based on 45.28 miles of Primary Arterials = 9,067

2015: VMT on Primary Arterials within Washed Sand Area = 524,493
VMT on Primary Arterials Subject to Sweeping (90.33%) = 473,774
Average VMT based on 45.28 miles of Primary Arterials = 10,458

The transportation model output that provided the VMT and mileages for Primary Arterials is included in Appendix D4.

Since the 2015 average ADT on Primary Arterials exceeds the assumed ADT within the SIP, the 2015 effectiveness was recalculated using the same equation used in the SIP:

$$\text{Control Efficiency } (\%) = 96 - (0.0121*V),$$

where V is vehicle passes since cleaning, calculated as follows:

$$V = (\text{ADT})*(\text{Time to Sweep All Streets})/(\text{Number of Lanes})$$

The SIP assumes two days to sweep all streets, and 4 lanes of traffic. Inserting 10,458 in the equation yields a value of 5,229 for V, which when inserted into the equation for efficiency provides a value of 32.7.

The arterial emission factor was adjusted downward to include the effect of street sweeping. For 1998 and 2005 the adjustment was 34%, while in 2015 the adjustment was 32.7%.

Washed Sand Area

Silt loading data for the period 1989-1991 provides information on silt loads when only washed sand is used. However, no data were available for arterial streets in Missoula. Data for Harrison Street in Butte, Montana for 1991 and 1992 were therefore used to provide a representative silt loading for arterials. The use of Butte data is based on similarities in road type, climate and sanding practices. These silt load measurements were used to calculate emission factors for areas where washed sand was required, but not de-icer. The resulting emission factors are shown in **TABLE D-6**.

The washed sand silt loading data in **TABLE D-5** and emission factors in **TABLE D-6** exhibit an apparent inconsistency. The single silt loading measurement available for collector streets within the "washed sand only" area is lower than the average of silt loadings measured within the "de-icer/washed sand" area. Intuitively, one would expect a higher silt load within the "washed sand only" area compared to the "de-icer/washed sand" area. However, with the very limited data base

TABLE D-7

Forecast PM$_{10}$ Nonattainment Area Vehicular Emissions for 1998, 2005 and 2015

Year	Source	Road Classification				Total (lbs)
		Freeway	Arterial	Collector	Local	
1998	**Road**	295	8,350	1,752	1,548	11,945
	Tailpipe					214
						12,159
2005	**Road**	325	9,189	1,957	1,705	13,176
	Tailpipe					181
						13,357
2015	**Road**	393	10,614	2,357	1,985	15,349
	Tailpipe					189
						15,538

Within the "washed sand" area some areas are also required to use de-icers. The portion of VMT within the 'washed sand" area also subject to de-icer use was estimated using estimates of the portion of VMT subject to de-icing from the SIP analysis. The SIP calculated that the following fractions of total VMT will be controlled by de-icing:

Freeway:	90.33%
Arterials:	87.30%
Collectors:	76.09%
Local:	50.49%

These fractions were used for 1998, 2005 and 2015. These fractions were applied to VMT within the "washed sand" area to estimate the VMT controlled by both washed sand and de-icing. The remaining VMT within the "washed sand" area is controlled by washed sand only. Implicit in this calculation is the assumption that VMT growth on roads where de-icer is used will occur at the same rate as within the nonattainment area as a whole. This is likely to be a conservative assumption for future years, since new areas annexed to the City of Missoula have been and will be required to use de-icers.[10]

TABLE D-7 shows the total road dust emissions of PM_{10} within the Missoula nonattainment area for 1998, 2005 and 2015. The 2005 and 2015 analysis is based directly on the transportation model runs. The 1998 analysis is based on interpolation between the 1994 Baseline model run and the 2005 Project model run. Spreadsheet printouts of the calculation of paved road PM_{10} emissions are included in Appendix D8. A sample calculation of the year 2015 emission factor and PM_{10} emissions from the "De-Icer/Washed Sand" area is also included.

TABLE D-7 also shows tailpipe emissions of PM_{10}. These were obtained by multiplying VMT within the PM_{10} nonattainment area by the tailpipe emission factor obtained from PART5 program.

The total of paved road and tailpipe emissions is also shown in **TABLE D-7**. These emissions are to be compared to the established emissions budget of 16,119 pounds. For all three analysis years, emissions with the recommended Missoula Urban Transportation Plan 1996 Update are less than the emissions budget.

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[10] An exception can be made in areas where terrain makes the use of de-icers impractical.

DEPARTMENT OF ENVIRONMENTAL QUALITY
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December 5, 1995

Doug Widmayer
Peccia & Associates
825 Custer Ave
Helena, MT 59601

RE: Air Quality Information for Missoula Transportation Conformity

As per our phone conversation last week, I have enclosed the following documents:

1) The final Missoula PM10 Emission Budget (Note: last page has final budget number)

2) A copy of the PM10 conformity analysis performed in Whitefish and Kalispell for the US 93 Project

3) Missoula Road Dust Control Strategies

4) Missoula Road Dust Control Strategies Effectiveness Evaluation

5) Missoula Road Dust Control - Contingency Measures

6) Missoula Road Dust Control - Contingency Measure Effectiveness Evaluation

7) Copies of PM10 and CO emission inventories

8) Copies of silt loading analysis performed in Missoula (as well as neighboring communities).

You should be aware that the Missoula PM10 SIP has been approved by EPA (Control Strategy Period), while the Missoula CO SIP is considered interim.

Concerning the Missoula CO Emission Budget: since the Missoula CO emission inventory used the Mobile 4.1 model, it is strongly suggested that your firm use the more current Mobile 5a model for conformity purposes. As you may already have determined from the Federal Transportation Conformity rule, the model needs to be run for the following scenarios:

Build,
No Build, and
1990 Emissions

A comparison needs to be done that shows that the build scenario will be less (by a non-zero amount) than No Build and 1990 emissions:

Build < No Build, and
Build < 1990 Emissions.

Because the Air Quality Division used a (now defunct) model to develop the existing CO emission inventory, I am currently working with EPA to determine which model should be used for each scenario. I suggest that your firm should also research which model is most appropriate for all of the scenarios.

In the meantime, I recommend tackling the PM10 analysis as soon as possible since PM10 emissions increase in proportion to increases in VMT. While I do not predict any problems with demonstrating conformity with the CO emission budget, I believe that the PM10 emission budget could be more complicated and that mitigation will likely be necessary.

Further, I hope that you will allow the Air Quality Division as well as the Montana Department of Transportation to review your input parameters (such as emission factors, horizon years, etc.) before you run an initial regional PM10 analysis.

Since I have some experience in PM10 control strategies I will make myself available to discuss possible additional mitigation strategies for the Missoula area, if the first run of your conformity analysis deems it necessary.

If you require any further air quality or SIP-related information, please do not hesitate to contact me.

Sincerely,

Gretchen Bennitt, Supervisor
State Implementation Plan

GB:kt

Enclosures

Donald Ballanti
Certified Consulting Meteorologist

1424 Scott Street
El Cerrito, Ca. 94530
(510) 234-6087
Fax: (510) 232-7752

January 5, 1996

Gretchen Bennitt
Montana Dept. of Environmental Quality
P.O. Box 200901
Helena, Montana 59620-0901

Subject: Proposed Protocol for PM-10 Conformity, Missoula Transportation Study

Dear Ms. Bennitt:

As we discussed on the phone, I have outlined a methodology and assumptions that I propose to use in preparing the PM-10 conformity analysis for the subject project. I intend to prepare a similar protocol letter for carbon monoxide at a later date.

Understanding of the Problem

My understanding is that, in order to determine conformity, the project must:[1]

- Show a reduction in PM-10 emissions when the Build scenario is compared to the No-Build scenario at the buildout year (2015)
- Show that the year 2015 Build scenario PM-10 emissions is less than the 1990 emissions budget.

The methodology to be used for this analysis should follow the basic method utilized in the Missoula PM-10 Emission Inventory and SIP. My understanding is that the emissions "budget" for 1995 is 16,119 pounds per day, as defined in a memo to Gretchen Bennitt from Ross Tervo.[2] This memo defines a 1995 emission budget based on a 1% annual increase of the 1987 base year analysis described in a earlier memo.[3]

---

[1] Letter from Gretchen Bennitt to Doug Widmayer dated December 5, 1995.

[2] Memo from Ross Tervo to Gretchen Bennitt dated October 4, 1995.

The situation is complicated by the fact that emission factors for both components of the PM-10 transportation budget (tailpipe emissions and road dust) have been revised since the SIP and emissions budget were prepared. It is my understanding that our analysis should utilize the latest emission factors, but that the calculation of the emissions "budget" does not require recalculation.

The basic task is to recreate the emissions budget calculation utilizing traffic numbers reflecting future conditions and updated emission factors.

Proposed Analysis

Transportation Data

Quantification of Vehicle Miles Travelled (VMT) is of primary importance. The necessary transportation numbers are:

- VMT within the PM-10 nonattainment area as a whole. This is needed to calculate tailpipe emissions.

- VMT within the "non-compliance" area and within the "de-icer" area. The Missoula PM-10 SIP analysis calculates the overall effectiveness of street sweeping, use of de-icers and use of washed sand as 62% within the "non-compliance area, but this control factor will vary as the proportion of VMT within these sub-areas changes and cannot be used as an effectiveness for year 2015. Therefore, the effectiveness of the control program as a whole will have to be re-calculated, hence the need to break down VMT into the smaller categories.

Emission Factors

The Missoula PM-10 SIP analysis utilized MOBILE 4.1 emission factors. This program has been superseded by the MOBILE 5a program. It should be straightforward to calculate tailpipe emissions within the non-attainment area by multiplying the PM-10 emission factor from MOBILE 5a by VMT.

---

[3] Memo from Robert Habeck to Gretchen Bennitt dated March 24, 1995.

Road dust emission factors are less straightforward. The Missoula PM-10 Inventory calculates road dust emission factors for four road categories based on AP-42 (Fourth Edition) data. These are multiplied by 4.9 to obtain spring road dust emission factors. The Missoula PM-10 SIP analysis uses these same spring road dust emission factors and the basic AP-42 road dust equation:

$$e = k(sL/0.7)^{p}$$

to calculate silt loads for the four road categories and the ultimately the effectiveness of control measures.

The latest version of AP-42 (Fifth Edition) has a completely different formulation for paved road dust:

$$e = k(sL/2)^{0.65}(W/3)^{1.5}$$

where k is a dimensionless multiplier, sL is the road surface loading, and W is the mean vehicle weight.

This new formulation could be used in two possible ways:

- As in the Missoula PM-10 SIP analysis, solve the formula for sL using the values for "e" used in the Missoula PM-10 Inventory. This would allow recalculation of control efficiencies based on this new formulation, but would still use the same overall "uncontrolled" emission factors contained in the inventory.
- Solve for "e" for each road category using measured sL values for Missoula during 1990 to 1992 contained in AP-42. It would have to be determined if these measurements reflect the effects of the control program or not.

Requested Guidance

Two questions remain in my mind, and I request clarification or advice:

- Should the year 2015 emissions be compared to the emissions budget in 1990 (as stated in your letter of

December 5) or the 1995 emissions inventory described in Ross Tervo's October 4 memo? I assume that at a 1990 inventory could be calculated from the 1987 inventory assuming a 1% annual increase in VMT.

- Which of the two approaches for using the new AP-42 emission factors for road dust would you recommend?

I hope that this information gives you a clear picture of the type of analysis being proposed. Please feel free to call with questions or suggestions on this matter.

Sincerely,

Donald Ballanti

Donald Ballanti
Certified Consulting Meteorologist

cc: Doug Widmayer, Peccia & Associates

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January 18, 1996

Donald Ballanti
1424 Scott Street
El Cerrito, CA. 94536

Dear Mr. Ballanti:

I received your January 5, 1996 letter concerning the proposed protocol for the Missoula Transportation Plan Conformity determination and have the following comments:

As we discussed on the phone following receipt of your fax, a regional conformity analysis of both PM10 and CO emissions must be completed according to Section 176(C)(1) of the 1990 Amendments to the Clean Air Act and 40 CFR, Part 51 (the federal transportation conformity rule.) This analysis must be completed in order to demonstrate conformity of the Missoula Transportation Plan with the State Implementation Plan (SIP). This analysis should be completed with the latest planning assumptions and emissions models as specified in Sections 51.412 and 51.414 of the transportation conformity rule.

PM10 Analysis

In my December 5, 1995 letter to Doug Widmayer, I discussed my interpretation of the federal conformity rule. I specifically outlined my interpretation of the CO emissions analysis requirements. You should be aware that your letter incorrectly states that these CO requirements should be utilized for PM10 analysis. The specific requirements for PM10 analysis can be determined by interpretation of the federal transportation conformity rule (40 CFR Part 51).

Further, the conformity determination is required to be legally compared to the approved SIP. The PM10 emission budget that was submitted to you is based upon the EPA-approved SIP emission inventory and attainment demonstration, although the SIP used a fourth edition AP-42 emission factor and road classification system that does not meet current standards.

It may be necessary to utilize the same road classification system in the conformity analysis that was used in the approved SIP. However, the department recommends that you review specifically Sections 51.412 and 51.414 of the rule and consult with the Missoula MPO as to what the final conformity analysis parameters should be.

I highly recommend that you determine, through consultation with the Missoula MPO, MDT, EPA, DEQ and the FHWA (as required by 40 CFR 51.402), the following parameters before you begin your regional analysis:

1. Emission factors
2. Silt loading values
3. Horizon years
4. Regionally significant projects
5. Current control strategies and their area of application
6. VMT projections
7. Load classification
8. An analysis protocol that meets 40 CFR Part 51 requirements for use of current professional methods and standards in preparing emission analysis.

Transportation Data

You mentioned that the VMT within the PM10 nonattainment area as a whole is necessary to determine. More specifically, the VMT in the area that was used to determine the emission budget is what should be used.

Emission Factors

Your letter incorrectly states that the Missoula PM10 SIP analysis utilized Mobile 4.1 emission factors, and that this has been superseded by the Mobile 5a program. These mobile models are not utilized for PM10, but rather for CO.

Requested Guidance

The following is my reply to your request for guidance:

- The PM10 emissions determined from the horizon year analyses should be compared to the 1995 emission budget that is based upon the base year emission inventory.
- The department recommends that you review Sections 51.412 and any other applicable sections of the conformity rule to determine which edition of AP-42 should be used in the conformity analysis. The Missoula MPO should make the final decision based upon consultation with EPA, FHWA, DEQ and MDT. For your information, the emission budget utilized the fourth edition of AP-42.

Mitigation

Once the conformity analysis for all of the horizon years is complete the CO emissions will likely decrease with the decrease of congestion. However, since the emissions of PM10 increase proportionately with the increase of VMT, it is highly likely that mitigation will be required to reach conformity for PM10. I have attached an April 1995 and November 1994 memo to MDT discussing the possible mitigation that could be implemented in Missoula.

Other additional mitigation possibilities that I did not mention in these memos are:

1. A memorandum of agreement between the local air and transportation agencies to agree to control strategies that would occur sometime in the future. For example, if Missoula is able to demonstrate conformity for the first horizon year analyses, but then has a problem meeting conformity at a later horizon year. an agreement to implement control strategies in future years could be the mitigation method.

2. Chemical deicer use on an area greater than the area currently being deiced.

3. Use of a cleaner traction material.

In conclusion. since the consulting agencies (EPA, FHWA, MDT, and DEQ) must agree that the conformity determination is correct, it is to yours and the Missoula MPO's benefit that all analysis parameters are reviewed and approved by the consulting agencies before actual analysis begins.

Sincerely,

Gretchen Bennitt

Gretchen Bennitt, Supervisor
State Implementation Plan

GB: kjh

cc: Mark Landkamer. Missoula MPO
Doug Widmayer. Peccia &Associates
Ross Tervo, MDT
Dave Miller. FHWA (Montana office)
Jeff Houk. EPA

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MEMORANDUM

TO: MARK LANDKAMMER, MISSOULA MPO
JEFF HOUK, EPA REGION 8
GRETCHEN BENNITT, MDEQ
ROSS TERVO, MDT
JIM CARLSON, MISSOULA CITY/COUNTY HEALTH DEPARTMENT
DAVE MILLER, MT FHWA

FROM: DON BALLANTI, CCM

SUBJECT: MISSOULA TRANSPORTATION PLAN CONFORMITY ANALYSIS

I have received comments from both Gretchen and Jeff on my March 12 protocol letter. This memo further refines the protocol, particularly where questions had been raised.

Analysis Years

The protocol letter erroneously identified the horizon year for the Transportation Plan as 2010, when it is actually 2015. It has also been verified that the PM-10 SIP includes a 1998 maintenance demonstration.

The carbon monoxide conformity analysis is now planned for 2005 and 2015. The PM-10 analysis will be for 1998, 2005 and 2015.

Hot Spot Analyses

It has been verified with Jeff Houk that a transportation plan does not require a hot spot analysis for either PM-10 or CO.

Vehicle Distribution Mix

It was verified with Jeff Houk that a 1994 vehicle distribution, although different than the

1990 distribution used in the SIP, is appropriate for the analysis.

Emissions Model Inputs

The specific inputs to the MOBILE-5a and PART5 programs are listed below for review.

MOBILE5a

The MOBILE 5a program would be used to predict future year CO emission factors. As in the SIP analysis, runs would be made under low altitude and high altitude assumptions and the results averaged. MOBILE 5a inputs are very similar to those for MOBILE 4.1. The one-time data inputs from the SIP analysis would be used in the conformity analysis, which include:

Tampering Rates: TAMFLAG = 1 (MOBILE5 Default)

Speed Variation: SPDFLG =1 (One value of average speed for all vehicle types)

VMT Mix: VMFLAG = 3 (User supplies a single VMT mix for all scenarios)

Annual Mileage Accumulation Rates: MYMRFG = 3 (User supplies registration distribution by age, use MOBILE5 annual mileage accumulation rates by age)

Basic Emission Rates: NEWFLG = 1 (MOBILE5 basic exhaust emission rates are used)

Inspection and Maintenance: IMFLAG = 1 (No I/M program is assumed to be operating)

Air Conditioning/Load/Humidity: ALHFLG = 1 (No additional correction factor inputs)

Anti-Tampering Program: ATPFLG = 1 (No anti-tampering program)

Refueling Emissions: RLFLAG = 1 (Use uncontrolled refueling emission rates for gas-fueled vehicles and all model years)

Local Area Parameter: LOCFLG = 2 (One local area parameter for all scenarios)

Calculate Exhaust Temperatures: TEMFLG = 2 (Use ambient temperature in calculating temperature corrections for exhaust emissions)

1990 URBAN

```
1            PROMPT
RECREATION OF MISSOULA CO SIP 1990 FACTORS USING MOBILE 5
1            TAMFLAG
1            SPEEDFLAG
2            VMFLAG
3            MYMRFG
1            NEWFLAG
1            IMFLAG
1            ALHFLG
1            ATPFLG
1            FLFLAG
2            LOCFLG
2            TEMFLG
4            OUTFMT
2            PRTFLG
1            IDLFLG
1            NMHFLG
1            HCFLAG
.010 .065 .060 .060 .059 .061 .062 .062 .050 .045        LDGV (1-10)
.054 .057 .056 .053 .044 .035 .020 .022 .020 .017        LDGV (11-20)
.015 .013 .012 .009 .040                                 LDGV (21-25)
.009 .044 .056 .050 .052 .072 .053 .057 .046 .038        LDGT1 (1-10)
.037 .038 .062 .058 .051 .039 .026 .026 .028 .022        LDGT1 (11-20)
.018 .017 .018 .015 .068                                 LDGT1 (21-25)
.009 .060 .056 .043 .014 .033 .030 .030 .026 .020        LDGT2 (1-10)
.029 .026 .072 .073 .060 .060 .038 .047 .053 .055        LDGT2 (11-20)
.030 .027 .024 .017 .069                                 LDGT2 (21-25)
.005 .012 .019 .024 .005 .023 .021 .017 .012 .012        HDGV (1-10)
.024 .031 .062 .033 .028 .025 .052 .031 .048 .042        HDGV (11-20)
.035 .045 .021 .036 .337                                 HDGV (21-25)
.010 .065 .060 .060 .059 .061 .062 .062 .050 .045        LDDV (1-10)
.054 .057 .056 .053 .044 .035 .020 .022 .020 .017        LDDV (11-10)
.015 .013 .012 .009 .040                                 LDDV (21-25)
.009 .044 .056 .050 .052 .072 .053 .057 .046 .038        LDDT (1-10)
.037 .038 .062 .058 .051 .039 .026 .026 .028 .022        LDDT (11-20)
.018 .017 .018 .015 .068                                 LDDT (21-25)
.049 .078 .078 .070 .041 .041 .049 .029 .016 .016        HDDV (1-10)
.058 .037 .074 .049 .037 .045 .033 .053 .053 .025        HDDV (11-20)
.000 .008 .008 .008 .045                                 HDDV (21-25)
.002 .022 .028 .034 .034 .042 .046 .052 .071 .088        MC (1-10)
.075 .506 .000 .000 .000 .000 .000 .000 .000 .000        MC (11-20)
.000 .000 .000 .000 .000                                 MC (21-25)
MISSOULA URBAN   E 24.8 38.4 15.0 15.0 95
1 90 55.0 32.1 44.8 19.7 47.0                             FW LOW ALT
.686.199.081.011.009.009.005.000                         URBAN VMT MIX
2 90 55.0 32.1 44.8 19.7 47.0                            FW HIGH ALT
.686.199.081.011.009.009.005.000                         URBAN VMT MIX
1 90 22.4 32.1 44.8 19.7 47.0                            ARTERIAL LOW ALT
.686.199.081.011.009.009.005.000                         URBAN VMT MIX
2 90 22.4 32.1 44.8 19.7 47.0                            ARTERIAL HIGH ALT
.686.199.081.011.009.009.005.000                         URBAN VMT MIX
1 90 20.2 32.1 44.8 19.7 47.0                            COLLECTOR LOW ALT
.686.199.081.011.009.009.005.000                         URBAN VMT MIX
2 90 20.2 32.1 44.8 19.7 47.0                            COLLECTOR HIGH ALT
.686.199.081.011.009.009.005.000                         URBAN VMT MIX
1 90 20.5 32.1 44.8 19.7 47.0                            LOCAL LOW ALT
.686.199.081.011.009.009.005.000                         URBAN VMT MIX
2 90 20.5 32.1 44.8 19.7 47.0                            LOCAL HIGH ALT
.686.199.081.011.009.009.005.000                         URBAN VMT MIX
```

```
+         _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 35.4   35.4   35.4          35.4   35.4   35.4   35.4   35.4
   VMT Mix:  0.634  0.245  0.085         0.015  0.009  0.009  0.003  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 69.26  96.90 152.12 111.12 204.37   1.58   2.70  12.31   0.00  83.72
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1990          Region: Low          Altitude:  500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                  Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+         _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 32.2   32.2   32.2          32.2   32.2   32.2   32.2   32.2
   VMT Mix:  0.634  0.245  0.085         0.015  0.009  0.009  0.003  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 59.29  75.90  97.55  81.48 147.24   1.22   1.39   8.42   0.00  66.74
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1990          Region: High         Altitude: 5500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                  Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+         _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 32.2   32.2   32.2          32.2   32.2   32.2   32.2   32.2
   VMT Mix:  0.634  0.245  0.085         0.015  0.009  0.009  0.003  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 74.78 104.00 161.17 118.72 220.43   1.72   2.94  13.40   0.00  89.98
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1990          Region: Low          Altitude:  500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                  Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+         _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 25.0   25.0   25.0          25.0   25.0   25.0   25.0   25.0
   VMT Mix:  0.634  0.245  0.085         0.015  0.009  0.009  0.003  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 74.01  94.16 124.25 101.91 189.54   1.58   1.80  10.90   0.00  83.46
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1990          Region: High         Altitude: 5500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                  Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+         _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 25.0   25.0   25.0          25.0   25.0   25.0   25.0   25.0
   VMT Mix:  0.634  0.245  0.085         0.015  0.009  0.009  0.003  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 91.98 125.99 186.73 141.63 283.76   2.23   3.81  17.36   0.00 109.42
 ______________________________________________________________________________
```

```
1RECREATION OF MISSOULA CO SIP 1990 FACTORS USING MOBILE 5
 MOBILE5a (26-Mar-93)
0
-M 49 Warning:
+                1.00     MYR sum not = 1. (will normalize)
-M 49 Warning:
+                1.00     MYR sum not = 1. (will normalize)
-M 49 Warning:
+                1.00     MYR sum not = 1. (will normalize)
0MISSOULA RURAL
                      Minimum Temp: 25. (F)   Maximum Temp: 38. (F)
                      Period 1 RVP: 15.0      Period 2 RVP: 15.0 Period 2 Yr: 2005
0Total HC emission factors include evaporative HC emission factors.
0______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1990          Region: Low          Altitude:  500. Ft.
                    I/M Program: No        Ambient Temp:   32.1 (F)
              Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
               Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV    LDDT   HDDV    MC   All Veh
+            _____  _____  _____  ______  ______ ______  ______ ______ _____  ______
 Veh. Spd.: 65.0   65.0   65.0           65.0   65.0    65.0   65.0   65.0
  VMT Mix:  0.634  0.245  0.085           0.015  0.009  0.009  0.003  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst   CO:130.40 192.55 237.56 204.14 197.28   1.24    1.41   8.54   0.00 153.05
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1990          Region: High         Altitude: 5500. Ft.
                    I/M Program: No        Ambient Temp:   32.1 (F)
              Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
               Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV    LDDT   HDDV    MC   All Veh
+            _____  _____  _____  ______  ______ ______  ______ ______ _____  ______
 Veh. Spd.: 65.0   65.0   65.0           65.0   65.0    65.0   65.0   65.0
  VMT Mix:  0.634  0.245  0.085           0.015  0.009  0.009  0.003  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst   CO:172.25 273.82 442.72 317.32 295.35   1.74    2.98  13.60   0.00 218.44
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1990          Region: Low          Altitude:  500. Ft.
                    I/M Program: No        Ambient Temp:   32.1 (F)
              Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
               Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV    LDDT   HDDV    MC   All Veh
+            _____  _____  _____  ______  ______ ______  ______ ______ _____  ______
 Veh. Spd.: 35.4   35.4   35.4           35.4   35.4    35.4   35.4   35.4
  VMT Mix:  0.634  0.245  0.085           0.015  0.009  0.009  0.003  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst   CO: 54.63  70.10  89.01  74.97 136.51   1.12    1.28   7.73   0.00  61.47
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1990          Region: High         Altitude: 5500. Ft.
                    I/M Program: No        Ambient Temp:   32.1 (F)
              Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
               Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV    LDDT   HDDV    MC   All Veh
```

1990 Rural

```
1               PROMPT
RECREATION OF MISSOULA CO SIP 1990 FACTORS USING MOBILE 5
1               TAMFLAG
1               SPEEDFLAG
2               VMFLAG
3               MYMRFG
1               NEWFLAG
1               IMFLAG
1               ALHFLG
1               ATPFLG
1               FLFLAG
2               LOCFLG
2               TEMFLG
4               OUTFMT
2               PRTFLG
1               IDLFLG
1               NMHFLG
1               HCFLAG
.010 .065 .060 .060 .059 .061 .062 .062 .050 .045        LDGV (1-10)
.054 .057 .056 .053 .044 .035 .020 .022 .020 .017        LDGV (11-20)
.015 .013 .012 .009 .040                                  LDGV (21-25)
.009 .044 .056 .050 .052 .072 .053 .057 .046 .038        LDGT1 (1-10)
.037 .038 .062 .058 .051 .039 .026 .026 .028 .022        LDGT1 (11-20)
.018 .017 .018 .015 .068                                  LDGT1 (21-25)
.009 .060 .056 .043 .014 .033 .030 .030 .026 .020        LDGT2 (1-10)
.029 .026 .072 .073 .060 .060 .038 .047 .053 .055        LDGT2 (11-20)
.030 .027 .024 .017 .069                                  LDGT2 (21-25)
.005 .012 .019 .024 .005 .023 .021 .017 .012 .012        HDGV (1-10)
.024 .031 .062 .033 .028 .025 .052 .031 .048 .042        HDGV (11-20)
.035 .045 .021 .036 .337                                  HDGV (21-25)
.010 .065 .060 .060 .059 .061 .062 .062 .050 .045        LDDV (1-10)
.054 .057 .056 .053 .044 .035 .020 .022 .020 .017        LDDV (11-10)
.015 .013 .012 .009 .040                                  LDDV (21-25)
.009 .044 .056 .050 .052 .072 .053 .057 .046 .038        LDDT (1-10)
.037 .038 .062 .058 .051 .039 .026 .026 .028 .022        LDDT (11-20)
.018 .017 .018 .015 .068                                  LDDT (21-25)
.049 .078 .078 .070 .041 .041 .049 .029 .016 .016        HDDV (1-10)
.058 .037 .074 .049 .037 .045 .033 .053 .053 .025        HDDV (11-20)
.000 .008 .008 .008 .045                                  HDDV (21-25)
.002 .022 .028 .034 .034 .042 .046 .052 .071 .088        MC (1-10)
.075 .506 .000 .000 .000 .000 .000 .000 .000 .000        MC (11-20)
.000 .000 .000 .000 .000                                  MC (21-25)
MISSOULA RURAL  E 24.8 38.4 15.0 15.0 95
1 90 65.0 32.1 44.8 19.7 47.0                              FW LOW ALT
.634.245.085.015.009.009.003.000                          RURAL VMT MIX
2 90 65.0 32.1 44.8 19.7 47.0                             FW HIGH ALT
.634.245.085.015.009.009.003.000                          RURAL VMT MIX
1 90 35.4 32.1 44.8 19.7 47.0                             ARTERIAL LOW ALT
.634.245.085.015.009.009.003.000                          RURAL VMT MIX
2 90 35.4 32.1 44.8 19.7 47.0                             ARTERIAL HIGH ALT
.634.245.085.015.009.009.003.000                          RURAL VMT MIX
1 90 32.2 32.1 44.8 19.7 47.0                             COLLECTOR LOW ALT
.634.245.085.015.009.009.003.000                          RURAL VMT MIX
2 90 32.2 32.1 44.8 19.7 47.0                             COLLECTOR HIGH ALT
.634.245.085.015.009.009.003.000                          RURAL VMT MIX
1 90 25.0 32.1 44.8 19.7 47.0                             LOCAL LOW ALT
.634.245.085.015.009.009.003.000                          RURAL VMT MIX
2 90 25.0 32.1 44.8 19.7 47.0                             LOCAL HIGH ALT
.634.245.085.015.009.009.003.000                          RURAL VMT MIX
```

The average vehicle weight of 3 tons seems awfully high for an urban area. This should be reviewed. It should also be adjusted to account for the season; there is probably less through truck traffic, RV traffic, logging truck traffic, construction vehicle traffic, farm vehicle traffic etc. in the winter.

The interstate emission factor seems way too high. It converts to 2.55 gm/VMT; the Denver study provided emission factors of 0.64 gm/VMT for unsanded freeways and 0.73 gm/VMT for sanded ones. Unless I-90 through Missoula seems noticeably more dirty than Denver freeways in the winter, I would use the lower Denver emission factor. Use of the 50th percentile silt loading may be an overly conservative assumption.

The older (1978) silt loadings are much higher than the more recent ones. You should look at those to see if you think they're representative of SIP attainment demonstration conditions.

The roadway classifications for both CO and PM10 should be adjusted for the 2010 analysis if changes in traffic volume would bump any roads to higher classifications.

RTE.	ACT.	ACC.
GP	cc	3/27
	[✓ FILE]	
TECH.	[✓ ADM]	ENF.

FAX

Conformity / MISSOULA COUNTY /
MISSOULA TRANS
PL

TO: Gretchen Bennitt
Montana AQB

Phone (406) 444-3454
Fax (406) 444-5275

FROM: Jeff Houk

Phone: (303) 312-6446
Fax (303) 312-6064

Pages to follow: 1

I have reviewed Don's 3/13/96 fax and have the following comments:

Who is going to define the "baseline" and "action" scenarios?

The road classifications for CO and PM10 should be the same. Since the CO analysis simply involves comparing the baseline and action scenarios and action vs. 1990, the road classifications shouldn't have a major impact on the results, unless the project mix is unusually skewed toward one road classification.

The CO analysis also has to consider the status of any TCMs in the CO SIP.

It would be helpful if Don could list the inputs he plans to use for the MOBILE5a and PART5 runs so that we could review them before he starts using the results.

The PM10 analysis can also take credit for emissions control programs which do not require a regulation to be implemented, with the condition that the agencies responsible for implementing those measures will have to provide written commitments to implement those measures as part of the conformity determination.

Does the PM10 SIP contain a maintenance demonstration for 1997 or 1998? If so, this will have to be an analysis year for PM10.

The horizon year of the transportation plan has to be an analysis year. I had originally thought that the horizon year was 2010, but now I'm hearing differently.

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MAR 15 1996
AIR QUALITY DIVISION

Use of the SIP assumptions is permitted by the conformity rule; the rule does not specifically mention this situation, and the discussion of planning assumptions addresses more global factors, such as growth rates and land use assumptions. The rule requires consistency with regard to other technical inputs to the SIP, such as temperatures. Finally, although there are arguments for revising the SIP assumptions, the SIP appears to be working (Missoula has not experienced exceedences of the PM10 standard for quite some time). At some point in the future, the Air Quality Division should revise the SIP (or produce a maintenance plan) using the revised roadway classification assumptions and bringing other elements up to date. Once that SIP is approved by EPA and its budget becomes effective, MDT should use the same inputs for conformity purposes.

MDT should use the SIP inputs in the newest AP-42 emission factor equation in its conformity analysis. Also, MDT should account for any new or expanded controls that have been implemented since the SIP was adopted, such as alternative deicers, paving or increased sweeping, and also any newer information about the effectiveness of existing controls. Any mitigation for which credit is assumed in the conformity analysis must be accompanied by a written commitment to carry out the mitigation from the agency responsible for its implementation. Finally, MDT can rely on long-term commitments for implementation of mitigation for showing conformity in future years. These commitments can be revised in future conformity determinations if newer information shows that different strategies are appropriate.

I hope this information is helpful. If you have any questions, please contact me at (303) 312-6446.

Sincerely,

Jeff Houk

Jeffrey A. Houk
Environmental Engineer

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

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MAR 20 1996
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RTE.	ACT.	A
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MAR 18 1996

Ref: 8P2-A March 15, 1996

Gretchen Bennitt
Air Quality Division
Montana Department of Environmental Quality
836 Front Street
P.O. Box 200901
Helena, MT 59620-0901

Dear Gretchen:

Conformity/Missou
Missou
Trai
Plai

I'm writing in response to your letter of January 18, 1996 to Donald Ballanti regarding the Missoula conformity determination. I agree with your conclusion that the conformity determination must be based on the emission budget in the approved SIP. The Clean Air Act is specific on this point. However, since the SIP does not state an explicit budget, you have some latitude in interpreting the SIP to determine what the budget should be. In general, the budget should reflect the attainment mobile source emission inventory (after control).

It's my understanding from conversations with you that the SIP is based on assumptions about roadway classifications that the Montana Department of Transportation (MDT) would prefer to revise in its conformity determination. However, the proposed change in assumptions would result in calculated emissions increases which could make it difficult or impossible to show conformity to the SIP. To resolve this problem, you had asked if it would be possible to produce a new emission budget using revised assumptions about roadway classifications (and thus, revised emission factors), and to use this budget for conformity. However, this is not permitted by the Clean Air Act. The Air Quality Division could revise the SIP and submit it to EPA for approval, but the new budget could not be used until it had been approved by EPA. The time involved for all of this to occur makes this an impractical solution to the current nonconformity problem.

Instead, I recommend that, for purposes of its conformity analysis, MDT use assumed roadway classifications consistent with those in the SIP. This would make the conformity analysis more consistent with the SIP analysis (which, after all, is the purpose of the emission budget test) and prevent nonconformity problems due solely to differing assumptions about road classification. Use of revised inputs would result in an unnecessary "apples and oranges" comparison. Also, it could result in continued nonconformity and continued inability to begin new transportation projects. Revision of the SIP assumptions through the conformity analysis does not seem to be worth such an extreme result.

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In conclusion. I strongly suggest that you begin as soon as possible to work with the PCC (with public involvement) to determine what method of mitigation may be necessary in order that the Missoula Transportation Plan conform to the PM10 SIP. The development of mitigation measures could include memorandums of agreement or even local ordinances. These are time-consuming tasks and should begin as soon as possible.

Sincerely,

Gretchen Bennitt

Gretchen Bennitt
SIP Unit Supervisor

GB:kjh
Enclosures

cc:
Mark Landkamer, Missoula MPO
Ross Tervo, MDT
Jim Carlson, Missoula City-County Health Dept
Dave Miller, MT FHWA
Jeff Houk, EPA, Region 8

4) Who will define the 'action' and 'baseline' scenarios? Who and how will you determine what is regionally significant in each of these scenarios? These should be developed through the PCC and public involvement, then confirmed through a meeting between interested parties.

5) There is no mention of whether hot spot analyses will be necessary for CO or PM10 emissions. This should be discussed with all of the interested parties. If it is decided that hot spot analyses are not needed, then documentation should be included to discuss the basis for not performing hot spot analyses.

6) The reason that the AQD and Missoula County separated rural and urban VMT distributions in the SIP was because of the marked difference in speeds between streets in rural areas (generally higher speed - higher emission rate) vs. streets in an urban area (lower speed - lower emission rate). However, since there is generally a larger quantity of VMT on urban streets than rural ones, the AQD agrees with your proposal that a single distribution of VMT by vehicle type be used in the analysis.

7) I strongly suggest that you initiate a discussion between EPA (Jeff Houk), the MPO, the Missoula City-County Health Department and myself concerning the discrepancies between the PM10 and CO emission budgets, emission inventories and the conformity analyses. For example, a 1990 vehicle distribution mix was used for the CO emission inventory, while you suggest using a 1994 vehicle distribution for the CO conformity analyses. Other factors that may differ between the budgets, inventories and analyses are; vehicle speeds, vehicle categories, temperatures for typical CO day, and mobile models. I have enclosed a March 15 letter from Jeff Houk for purposes of initiating such a discussion.

8) I agree with Jeff Houk's comments that all of the model inputs should be run by the interested parties before you run your model.

9) I noticed that you used only 1978 through 1992 silt loading data. I have enclosed the most recent silt loading data from Montana. I suggest that you should use only the most recent SPRING silt loadings from Missoula. Additionally, the silt loading data should be representative of whatever controls were being utilized at the time the samples were taken. I recommend that you contact the City of Missoula (either public works or the City-County Health Department) to determine when controls were used. In general, I believe that the Health Department attempted to collect the spring silt load samples as soon as the streets dried out and before the street sweeping regimen began for that season.

DEPARTMENT OF ENVIRONMENTAL QUALITY

AIR QUALITY DIVISION

MARC RACICOT, GOVERNOR
1520 E 6TH

STATE OF MONTANA

(406) 444-3454
(406) 444-3671
FAX (406) 444-5275

PO BOX 200901
HELENA, MONTANA 59620-0901

April 9, 1996

Donald Ballanti
Certified Consultant Meteorologist
1424 Scott Street
El Cerrito, Ca. 94530

Dear Don:

Thank you for sending me your proposed protocol for the Missoula Transportation Plan conformity determination. Since the State Air Quality Division (AQD) plays only a consultative role during a conformity analysis, the following are only suggestions to your protocol. In general, I believe you need to include more detail in your protocol, since it was not clear who will be performing which tasks and what your data inputs for the models will be. In addition, I have the following specific suggestions:

1) Since I was the addressed recipient of your letter, I received a couple of comments from a few interested parties. I have attached a comment letter from Jeff Houk (Region 8, EPA). I also received oral comments from Montana Department of Transportation (MDT), so I am incorporating their comments as well. I appreciate you sending me the protocol, however, in the future please address all pertinent documents to the responsible party - the Metropolitan Planning Organization (MPO). Of course, I would still appreciate receiving copies of all pertinent documents.

2) I suggest that you add Jim Carlson of the Missoula City-County Health Department to your list of interested parties. The Missoula City-County Health Department, in cooperation with the AQD, developed both the PM10 and CO SIPs.

3) The analysis years are different than the years that have been decided for the N. Reserve project conformity analysis, as well as the memo from MDT's Bob Barry to Mark Landkammer (January 19, 1996). In addition, EPA has suggested that 1998 should also be included since the PM10 SIP contains a maintenance demonstration for that year. I suggest that these be determined initially through the Policy Coordinating Committee (PCC) and then confirmed through a meeting (conference call?) between all interested parties to determine the analysis years.

Road Dust Emission Factors

I am proceeding with a recalculation of the PM-10 emission factors by road type. Gretchen has provided additional data on silt loading. A calculation of the average vehicle weight in Missoula based on 4% heavy trucks provides an average vehicle weight of 2.64 tons. I intend to use this value rather than the 3 tons default value in AP-42. I will be sending out the revised road dust emission rates for review in the next few days.

Calendar Year: 2005 and 2015

Speed: Will be varied to obtain required information.

Ambient Temperature: 32.1 degrees F, as per SIP analysis

Operating Modes: PCCN = 44.8%, PCHC = 19.7%, PCCC = 47.0 % as per SIP.

PART5

The PART5 program provides exhaust emission factors for PM-10. Inputs to PART5 are similar to those for MOBILE5a, but less numerous because the program only needs information pertaining to PM-10 emissions. The PART5 control flags are:

VMT Mix: VMFLAG = 3 (User supplies a single VMT mix for all scenarios)

Annual Mileage Accumulation Rates: MYMRFG = 3 (User supplies registration distribution by age, use MOBILE5 annual mileage accumulation rates by age)

Inspection and Maintenance: IMFLAG = 1 (No I/M program is assumed to be operating)

Reformulated Gasoline: RFGLG = 1 (No reformulated gasoline)

Output Format: OUTFMT = 3 (115-133 column text format)

Idle Emissions: IDLFLG = 1 (Do not print idle emission results)

Gaseous SO2: SO2FLG = 1 (Do not print SO2 emission factors)

Pollutants Reported: PRTFLG = 2 (Exhaust PM factors only)

Scenario inputs include:

Region: (Both high-altitude and low-altitude will be run)

Calendar Year: 1998, 2005 and 2015

Speed: 15 mph as per SIP analysis

Output Format: OUTFMT = 4 (80 character output)

Pollutants: PRTFLG = 2 (Carbon monoxide only)

Idle Emissions: IDLFLG = 1 (Do not print idle emission results)

Hydrocarbon output: NMHFLG,HCFLG =1 (Does not affect CO emission calculation)

The above are all identical to the MOBILE4 inputs from the SIP except for VMFLAG. In the SIP analysis, VMFLAG=2 so that different rural and urban vehicle mixes could be specified. Since we are not differentiating between rural and urban VMT, the VMT mix can be specified once (VMFLAG = 3). The VMT mix itself will be different, reflecting 1994 data rather than the 1990 data used in the SIP analysis.

The one-time data will include the VMT mix and annual mileage accumulation rates. The 1994 vehicle mix will be input, the vehicle age distribution used in the SIP analysis will be used.

Because LOCFLG =2, a Local Area Parameter record appears in the one-time data section. This record contains:

ASTM Volatility Class: Class E, as in SIP analysis.

Minimum and Maximum Daily Temperature: 24.8 and 38.4 degrees F, as per SIP

The following parameters do not affect CO emissions; the values used in the SIP analysis will be used:

Base Reid Vapor Pressure
In-Use RVP/Start Year

Oxygenated Fuels (assumed in SIP analysis to be implemented by 1993) will also be assumed for the conformity analysis, using the same variables describing the oxygenated fuels program that were used in the SIP.

The scenario section provides the following information:

Region: (Both high-altitude and low-altitude will be run as in the SIP)

```
1RECREATION OF MISSOULA CO SIP 1990 FACTORS USING MOBILE 5
 MOBILE5a (26-Mar-93)
0
-M 49 Warning:
+                1.00     MYR sum not = 1. (will normalize)
-M 49 Warning:
+                1.00     MYR sum not = 1. (will normalize)
-M 49 Warning:
+                1.00     MYR sum not = 1. (will normalize)
0MISSOULA URBAN
                    Minimum Temp: 25. (F)   Maximum Temp: 38. (F)
                    Period 1 RVP: 15.0      Period 2 RVP: 15.0 Period 2 Yr: 1995
0Total HC emission factors include evaporative HC emission factors.
0_______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1990           Region: Low           Altitude:  500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                 Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  ______  ______  _____  _____  _____  _____  ______
 Veh. Spd.: 55.0   55.0   55.0            55.0   55.0   55.0   55.0   55.0
   VMT Mix:  0.686  0.199  0.081           0.011  0.009  0.009  0.005  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 44.02  59.71  70.94  62.96 140.42   1.00   1.14   6.91   0.00  49.42
 _______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1990           Region: High          Altitude: 5500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                 Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  ______  ______  _____  _____  _____  _____  ______
 Veh. Spd.: 55.0   55.0   55.0            55.0   55.0   55.0   55.0   55.0
   VMT Mix:  0.686  0.199  0.081           0.011  0.009  0.009  0.005  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 57.55  85.15 137.52 100.30 210.22   1.41   2.41  11.00   0.00  69.96
 _______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1990           Region: Low           Altitude:  500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                 Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  ______  ______  _____  _____  _____  _____  ______
 Veh. Spd.: 22.4   22.4   22.4            22.4   22.4   22.4   22.4   22.4
   VMT Mix:  0.686  0.199  0.081           0.011  0.009  0.009  0.005  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 81.29 102.56 137.24 112.59 213.54   1.77   2.03  12.25   0.00  89.73
 _______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1990           Region: High          Altitude: 5500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                 Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
```

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+                  ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 22.4   22.4   22.4          22.4   22.4   22.4   22.4   22.4
   VMT Mix:  0.686  0.199  0.081         0.011  0.009  0.009  0.005  0.000
OComposite Emission Factors (Gm/Mile)
 Exhst  CO:100.21 135.77 197.46 153.62 319.70   2.50   4.28  19.51   0.00 115.43
__________________________________________________________________________________
OEmission factors are as of Jan. 1st of the indicated calendar year.
OUser supplied veh registration distributions.
OCal. Year: 1990           Region: Low           Altitude:  500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
               Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
OVeh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+                  ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 20.2   20.2   20.2          20.2   20.2   20.2   20.2   20.2
   VMT Mix:  0.686  0.199  0.081         0.011  0.009  0.009  0.005  0.000
OComposite Emission Factors (Gm/Mile)
 Exhst  CO: 88.69 110.66 150.46 122.17 238.97   1.97   2.26  13.66   0.00  97.79
__________________________________________________________________________________
OEmission factors are as of Jan. 1st of the indicated calendar year.
OUser supplied veh registration distributions.
OCal. Year: 1990           Region: High          Altitude: 5500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
               Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
OVeh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+                  ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 20.2   20.2   20.2          20.2   20.2   20.2   20.2   20.2
   VMT Mix:  0.686  0.199  0.081         0.011  0.009  0.009  0.005  0.000
OComposite Emission Factors (Gm/Mile)
 Exhst  CO:108.44 145.03 207.71 163.16 357.77   2.79   4.77  21.74   0.00 124.19
__________________________________________________________________________________
OEmission factors are as of Jan. 1st of the indicated calendar year.
OUser supplied veh registration distributions.
OCal. Year: 1990           Region: Low           Altitude:  500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
               Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
OVeh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+                  ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 20.5   20.5   20.5          20.5   20.5   20.5   20.5   20.5
   VMT Mix:  0.686  0.199  0.081         0.011  0.009  0.009  0.005  0.000
OComposite Emission Factors (Gm/Mile)
 Exhst  CO: 87.60 109.48 148.50 120.77 235.19   1.94   2.22  13.45   0.00  96.60
__________________________________________________________________________________
OEmission factors are as of Jan. 1st of the indicated calendar year.
OUser supplied veh registration distributions.
OCal. Year: 1990           Region: High          Altitude: 5500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
               Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
OVeh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+                  ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 20.5   20.5   20.5          20.5   20.5   20.5   20.5   20.5
   VMT Mix:  0.686  0.199  0.081         0.011  0.009  0.009  0.005  0.000
OComposite Emission Factors (Gm/Mile)
 Exhst  CO:107.23 143.70 206.22 161.79 352.10   2.75   4.70  21.41   0.00 122.91
__________________________________________________________________________________
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CO 1998
NO Project

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1                PROMPT
MISSOULA CO 1998 w/O PROJECT FACTORS USING MOBILE 5
                 TAMFLAG
1                SPEEDFLAG
2                VMFLAG
                 MYMRFG
1                NEWFLAG
1                IMFLAG
                 ALHFLG
1                ATPFLG
1                FLFLAG
                 LOCFLG
2                TEMFLG
4                OUTFMT
                 PRTFLG
1                IDLFLG
1                NMHFLG
                 HCFLAG
.061 .054 .054 .061 .063 .064 .068 .065 .062 .059        LDGV (1-10)
.054 .038 .030 .033 .032 .035 .031 .024 .017 .010        LDGV (11-20)
010 .011 .010 .007 .047                                  LDGV (21-25)
.059 .051 .045 .047 .044 .053 .051 .049 .062 .048        LDGT1 (1-10)
051 .036 .026 .027 .028 .048 .048 .039 .030 .016         LDGT1 (11-20)
019 .020 .016 .011 .076                                  LDGT1 (21-25)
.051 .027 .028 .035 .051 .050 .044 .016 .031 .029        LDGT2 (1-10)
030 .026 .018 .026 .025 .062 .062 .055 .048 .034         LDGT2 (11-20)
035 .042 .040 .023 .112                                  LDGT2 (21-25)
.036 .042 .035 .025 .026 .038 .026 .020 .027 .028        HDGV (1-10)
023 .020 .017 .031 .028 .070 .052 .037 .029 .035         HDGV (11-20)
040 .039 .025 .028 .223                                  HDGV (21-25)
.061 .054 .054 .061 .063 .064 .068 .065 .062 .059        LDDV (1-10)
054 .038 .030 .033 .032 .035 .031 .024 .017 .010         LDDV (11-10)
010 .011 .010 .007 .047                                  LDDV (21-25)
.059 .051 .045 .047 .044 .053 .051 .049 .062 .048        LDDT (1-10)
051 .036 .026 .027 .028 .048 .048 .039 .030 .016         LDDT (11-20)
019 .020 .016 .011 .076                                  LDDT (21-25)
.175 .080 .049 .070 .074 .043 .063 .038 .039 .035        HDDV (1-10)
022 .016 .015 .018 .028 .023 .026 .023 .014 .019         HDDV (11-20)
017 .033 .016 .022 .052                                  HDDV (21-25)
.023 .041 .024 .024 .021 .028 .020 .033 .045 .042        MC (1-10)
049 .650 .000 .000 .000 .000 .000 .000 .000 .000         MC (11-20)
000 .000 .000 .000 .000                                  MC (21-25)
MISSOULA 1998    E 24.8 38.4 15.0 15.0 95 2
800 .200 .027 .035  1
1 98 51.7 32.1 44.8 19.7 47.0                            FW LOW ALT
.637.238.071.020.006.011.017.000                         VMT MIX
 98 51.7 32.1 44.8 19.7 47.0                             FW HIGH ALT
637.238.071.020.006.011.017.000                          VMT MIX
1 98 29.4 32.1 44.8 19.7 47.0                            ARTERIAL LOW ALT
637.238.071.020.006.011.017.000                          VMT MIX
2 98 29.4 32.1 44.8 19.7 47.0                            ARTERIAL HIGH ALT
.637.238.071.020.006.011.017.000                         VMT MIX
 98 25.7 32.1 44.8 19.7 47.0                             COLLECTOR LOW ALT
637.238.071.020.006.011.017.000                          VMT MIX
2 98 25.7 32.1 44.8 19.7 47.0                            COLLECTOR HIGH ALT
637.238.071.020.006.011.017.000                          VMT MIX
1 98 16.9 32.1 44.8 19.7 47.0                            LOCAL LOW ALT
.637.238.071.020.006.011.017.000                         VMT MIX
 98 16.9 32.1 44.8 19.7 47.0                             LOCAL HIGH ALT
637.238.071.020.006.011.017.000                          VMT MIX
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1MISSOULA CO 1998 W/O PROJECT FACTORS USING MOBILE 5
 MOBILE5a (26-Mar-93)
0
-M 49 Warning:
+                1.01      MYR sum not = 1. (will normalize)
0MISSOULA 1998
                    Minimum Temp: 25. (F)   Maximum Temp: 38. (F)
                    Period 1 RVP: 15.0      Period 2 RVP: 15.0 Period 2 Yr: 1995
0Total HC emission factors include evaporative HC emission factors.
0_____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low            Altitude:  500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                  Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 51.7   51.7   51.7          51.7   51.7   51.7   51.7   51.7
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 17.83  25.85  41.13  29.36  48.54   1.03   1.15   5.70   0.00  21.52
 _____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: High           Altitude: 5500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                  Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 51.7   51.7   51.7          51.7   51.7   51.7   51.7   51.7
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 19.82  32.39  66.09  40.13  71.73   1.35   2.44   9.33   0.00  26.66
 _____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low            Altitude:  500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                  Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 29.4   29.4   29.4          29.4   29.4   29.4   29.4   29.4
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 28.53  38.37  60.12  43.37  59.05   1.42   1.58   7.82   0.00  32.91
 _____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
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0Cal. Year: 1998          Region: High         Altitude: 5500. Ft.
                   I/M Program: No       Ambient Temp:    32.1 (F)
             Anti-tam. Program: No     Operating Mode:    44.8 / 19.7 / 47.0
              Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 29.4   29.4   29.4           29.4   29.4   29.4   29.4   29.4
   VMT Mix:  0.637  0.238  0.071          0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 30.75  45.91  84.88  54.87  87.26   1.86   3.35  12.80   0.00  38.55
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low          Altitude:  500. Ft.
                   I/M Program: No       Ambient Temp:    32.1 (F)
             Anti-tam. Program: No     Operating Mode:    44.8 / 19.7 / 47.0
              Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 25.7   25.7   25.7           25.7   25.7   25.7   25.7   25.7
   VMT Mix:  0.637  0.238  0.071          0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 32.59  43.32  67.80  48.94  67.81   1.63   1.82   9.00   0.00  37.42
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: High         Altitude: 5500. Ft.
                   I/M Program: No       Ambient Temp:    32.1 (F)
             Anti-tam. Program: No     Operating Mode:    44.8 / 19.7 / 47.0
              Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 25.7   25.7   25.7           25.7   25.7   25.7   25.7   25.7
   VMT Mix:  0.637  0.238  0.071          0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 34.90  51.27  92.33  60.70 100.20   2.14   3.85  14.73   0.00  43.30
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low          Altitude:  500. Ft.
                   I/M Program: No       Ambient Temp:    32.1 (F)
             Anti-tam. Program: No     Operating Mode:    44.8 / 19.7 / 47.0
              Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 16.9   16.9   16.9           16.9   16.9   16.9   16.9   16.9
   VMT Mix:  0.637  0.238  0.071          0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
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 Exhst  CO: 46.92  60.66  97.23  69.07 106.35    2.52    2.81  13.87   0.00  53.64
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: High          Altitude: 5500. Ft.
                    I/M Program: No        Ambient Temp:   32.1 (F)
               Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  ______
 Veh. Spd.: 16.9   16.9   16.9          16.9   16.9   16.9   16.9   16.9
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 49.38  70.06 119.32  81.38 157.16    3.30    5.94  22.72   0.00  60.22
 ______________________________________________________________________________
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CO 2005
No Project

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1              PROMPT
MISSOULA CO 2005 W/O PROJECT FACTORS USING MOBILE 5
1              TAMFLAG
1              SPEEDFLAG
2              VMFLAG
3              MYMRFG
1              NEWFLAG
1              IMFLAG
1              ALHFLG
1              ATPFLG
1              FLFLAG
2              LOCFLG
2              TEMFLG
4              OUTFMT
2              PRTFLG
1              IDLFLG
1              NMHFLG
1              HCFLAG
.061 .054 .054 .061 .063 .064 .068 .065 .062 .059       LDGV (1-10)
.054 .038 .030 .033 .032 .035 .031 .024 .017 .010       LDGV (11-20)
.010 .011 .010 .007 .047                                LDGV (21-25)
.059 .051 .045 .047 .044 .053 .051 .049 .062 .048       LDGT1 (1-10)
.051 .036 .026 .027 .028 .048 .048 .039 .030 .016       LDGT1 (11-20)
.019 .020 .016 .011 .076                                LDGT1 (21-25)
.051 .027 .028 .035 .051 .050 .044 .016 .031 .029       LDGT2 (1-10)
.030 .026 .018 .026 .025 .062 .062 .055 .048 .034       LDGT2 (11-20)
.035 .042 .040 .023 .112                                LDGT2 (21-25)
.036 .042 .035 .025 .026 .038 .026 .020 .027 .028       HDGV (1-10)
.023 .020 .017 .031 .028 .070 .052 .037 .029 .035       HDGV (11-20)
.040 .039 .025 .028 .223                                HDGV (21-25)
.061 .054 .054 .061 .063 .064 .068 .065 .062 .059       LDDV (1-10)
.054 .038 .030 .033 .032 .035 .031 .024 .017 .010       LDDV (11-10)
.010 .011 .010 .007 .047                                LDDV (21-25)
.059 .051 .045 .047 .044 .053 .051 .049 .062 .048       LDDT (1-10)
.051 .036 .026 .027 .028 .048 .048 .039 .030 .016       LDDT (11-20)
.019 .020 .016 .011 .076                                LDDT (21-25)
.175 .080 .049 .070 .074 .043 .063 .038 .039 .035       HDDV (1-10)
.022 .016 .015 .018 .028 .023 .026 .023 .014 .019       HDDV (11-20)
.017 .033 .016 .022 .052                                HDDV (21-25)
.023 .041 .024 .024 .021 .028 .020 .033 .045 .042       MC (1-10)
.049 .650 .000 .000 .000 .000 .000 .000 .000 .000       MC (11-20)
.000 .000 .000 .000 .000                                MC (21-25)
MISSOULA 2005     E 24.8 38.4 15.0 15.0 95 2
.800 .200 .027 .035  1
1 05 51.5 32.1 44.8 19.7 47.0                           FW LOW ALT
.637.238.071.020.006.011.017.000                        VMT MIX
2 05 51.5 32.1 44.8 19.7 47.0                           FW HIGH ALT
.637.238.071.020.006.011.017.000                        VMT MIX
1 05 29.0 32.1 44.8 19.7 47.0                           ARTERIAL LOW ALT
.637.238.071.020.006.011.017.000                        VMT MIX
2 05 29.0 32.1 44.8 19.7 47.0                           ARTERIAL HIGH ALT
.637.238.071.020.006.011.017.000                        VMT MIX
1 05 25.8 32.1 44.8 19.7 47.0                           COLLECTOR LOW ALT
.637.238.071.020.006.011.017.000                        VMT MIX
2 05 25.8 32.1 44.8 19.7 47.0                           COLLECTOR HIGH ALT
.637.238.071.020.006.011.017.000                        VMT MIX
1 05 17.0 32.1 44.8 19.7 47.0                           LOCAL LOW ALT
.637.238.071.020.006.011.017.000                        VMT MIX
2 05 17.0 32.1 44.8 19.7 47.0                           LOCAL HIGH ALT
.637.238.071.020.006.011.017.000                        VMT MIX
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1MISSOULA CO 2005 W/O PROJECT FACTORS USING MOBILE 5
 MOBILE5a (26-Mar-93)
0
-M 49 Warning:
+         1.01    MYR sum not = 1. (will normalize)
0MISSOULA 2005
                    Minimum Temp: 25. (F)   Maximum Temp: 38. (F)
                    Period 1 RVP: 15.0      Period 2 RVP: 15.0 Period 2 Yr: 1995
0Total HC emission factors include evaporative HC emission factors.
0_____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: Low          Altitude:  500. Ft.
                     I/M Program: No       Ambient Temp:   32.1 (F)
                Anti-tam. Program: No     Operating Mode:   44.8 / 19.7 / 47.0
                 Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 51.5   51.5   51.5          51.5   51.5   51.5   51.5   51.5
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 12.02  17.66  27.32  19.88  21.20   0.91   0.95   5.41   0.00  14.33
 _____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: High         Altitude: 5500. Ft.
                     I/M Program: No       Ambient Temp:   32.1 (F)
                Anti-tam. Program: No     Operating Mode:   44.8 / 19.7 / 47.0
                 Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 51.5   51.5   51.5          51.5   51.5   51.5   51.5   51.5
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 12.15  19.11  31.04  21.85  33.59   1.07   1.74   8.94   0.00  15.34
 _____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: Low          Altitude:  500. Ft.
                     I/M Program: No       Ambient Temp:   32.1 (F)
                Anti-tam. Program: No     Operating Mode:   44.8 / 19.7 / 47.0
                 Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 29.0   29.0   29.0          29.0   29.0   29.0   29.0   29.0
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 22.32  29.77  41.45  32.45  26.22   1.27   1.32   7.54   0.00  24.92
 _____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
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0Cal. Year: 2005          Region: High         Altitude: 5500. Ft.
                    I/M Program: No        Ambient Temp:   32.1 (F)
              Anti-tam. Program: No      Operating Mode:    44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                            Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 29.0   29.0   29.0          29.0   29.0   29.0   29.0   29.0
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 22.49  31.55  45.94  34.85  41.55   1.49   2.43  12.46   0.00  26.17
 ________________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: Low          Altitude:  500. Ft.
                    I/M Program: No        Ambient Temp:   32.1 (F)
              Anti-tam. Program: No      Operating Mode:    44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                            Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 25.8   25.8   25.8          25.8   25.8   25.8   25.8   25.8
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 25.55  33.56  45.88  36.39  29.59   1.43   1.49   8.51   0.00  28.28
 ________________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: High         Altitude: 5500. Ft.
                    I/M Program: No        Ambient Temp:   32.1 (F)
              Anti-tam. Program: No      Operating Mode:    44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                            Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 25.8   25.8   25.8          25.8   25.8   25.8   25.8   25.8
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 25.73  35.44  50.60  38.93  46.88   1.68   2.75  14.07   0.00  29.64
 ________________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: Low          Altitude:  500. Ft.
                    I/M Program: No        Ambient Temp:   32.1 (F)
              Anti-tam. Program: No      Operating Mode:    44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                            Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 17.0   17.0   17.0          17.0   17.0   17.0   17.0   17.0
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
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 Exhst  CO: 37.69  47.90  63.84  51.56  46.31   2.20   2.30  13.11   0.00  41.13
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: High          Altitude: 5500. Ft.
                    I/M Program: No        Ambient Temp:   32.1 (F)
              Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
               Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV     MC  All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.:  17.0   17.0   17.0          17.0   17.0   17.0   17.0   17.0
   VMT Mix: 0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 37.94  50.35  69.97  54.86  73.38   2.59   4.23  21.67   0.00  43.02
 ______________________________________________________________________________
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CO 2015
NO Project

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1              PROMPT
NO PROJECT CO 2015 FACTORS USING MOBILE 5 N
1              TAMFLAG
1              SPEEDFLAG
2              VMFLAG
3              MYMRFG
1              NEWFLAG
1              IMFLAG
1              ALHFLG
1              ATPFLG
1              FLFLAG
2              LOCFLG
2              TEMFLG
4              OUTFMT
2              PRTFLG
1              IDLFLG
1              NMHFLG
1              HCFLAG
.061 .054 .054 .061 .063 .064 .068 .065 .062 .059      LDGV (1-10)
.054 .038 .030 .033 .032 .035 .031 .024 .017 .010      LDGV (11-20)
.010 .011 .010 .007 .047                               LDGV (21-25)
.059 .051 .045 .047 .044 .053 .051 .049 .062 .048      LDGT1 (1-10)
.051 .036 .026 .027 .028 .048 .048 .039 .030 .016      LDGT1 (11-20)
.019 .020 .016 .011 .076                               LDGT1 (21-25)
.051 .027 .028 .035 .051 .050 .044 .016 .031 .029      LDGT2 (1-10)
.030 .026 .018 .026 .025 .062 .062 .055 .048 .034      LDGT2 (11-20)
.035 .042 .040 .023 .112                               LDGT2 (21-25)
.036 .042 .035 .025 .026 .038 .026 .020 .027 .028      HDGV (1-10)
.023 .020 .017 .031 .028 .070 .052 .037 .029 .035      HDGV (11-20)
.040 .039 .025 .028 .223                               HDGV (21-25)
.061 .054 .054 .061 .063 .064 .068 .065 .062 .059      LDDV (1-10)
.054 .038 .030 .033 .032 .035 .031 .024 .017 .010      LDDV (11-10)
.010 .011 .010 .007 .047                               LDDV (21-25)
.059 .051 .045 .047 .044 .053 .051 .049 .062 .048      LDDT (1-10)
.051 .036 .026 .027 .028 .048 .048 .039 .030 .016      LDDT (11-20)
.019 .020 .016 .011 .076                               LDDT (21-25)
.175 .080 .049 .070 .074 .043 .063 .038 .039 .035      HDDV (1-10)
.022 .016 .015 .018 .028 .023 .026 .023 .014 .019      HDDV (11-20)
.017 .033 .016 .022 .052                               HDDV (21-25)
.023 .041 .024 .024 .021 .028 .020 .033 .045 .042      MC (1-10)
.049 .650 .000 .000 .000 .000 .000 .000 .000 .000      MC (11-20)
.000 .000 .000 .000 .000                               MC (21-25)
MISSOULA 2015    E 24.8 38.4 15.0 15.0 95 2
.800 .200 .027 .035  1
1 15 51.3 32.1 44.8 19.7 47.0                          FW LOW ALT
.637.238.071.020.006.011.017.000                       VMT MIX
2 15 51.3 32.1 44.8 19.7 47.0                          FW HIGH ALT
.637.238.071.020.006.011.017.000                       VMT MIX
1 15 28.3 32.1 44.8 19.7 47.0                          ARTERIAL LOW ALT
.637.238.071.020.006.011.017.000                       VMT MIX
2 15 28.3 32.1 44.8 19.7 47.0                          ARTERIAL HIGH ALT
.637.238.071.020.006.011.017.000                       VMT MIX
1 15 25.5 32.1 44.8 19.7 47.0                          COLLECTOR LOW ALT
.637.238.071.020.006.011.017.000                       VMT MIX
2 15 25.5 32.1 44.8 19.7 47.0                          COLLECTOR HIGH ALT
.637.238.071.020.006.011.017.000                       VMT MIX
1 15 17.3 32.1 44.8 19.7 47.0                          LOCAL LOW ALT
.637.238.071.020.006.011.017.000                       VMT MIX
2 15 17.3 32.1 44.8 19.7 47.0                          LOCAL HIGH ALT
.637.238.071.020.006.011.017.000                       VMT MIX
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1NO PROJECT CO 2015 FACTORS USING MOBILE 5 N
 MOBILE5a (26-Mar-93)
0
-M 49 Warning:
+              1.01     MYR sum not = 1. (will normalize)
0MISSOULA 2015
                     Minimum Temp: 25. (F)   Maximum Temp: 38. (F)
                     Period 1 RVP: 15.0      Period 2 RVP: 15.0 Period 2 Yr: 1995
0Total HC emission factors include evaporative HC emission factors.
0_______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015         Region: Low          Altitude:  500. Ft.
                    I/M Program: No         Ambient Temp:   32.1 (F)
               Anti-tam. Program: No       Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC  All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 51.3   51.3   51.3          51.3   51.3   51.3   51.3   51.3
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO:  9.73  15.27  21.44  16.69  11.26   0.83   0.91   5.28   0.00  11.69
 _______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015         Region: High         Altitude: 5500. Ft.
                    I/M Program: No         Ambient Temp:   32.1 (F)
               Anti-tam. Program: No       Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC  All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 51.3   51.3   51.3          51.3   51.3   51.3   51.3   51.3
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO:  9.73  15.30  21.52  16.73  21.92   0.83   1.47   8.74   0.00  11.98
 _______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015         Region: Low          Altitude:  500. Ft.
                    I/M Program: No         Ambient Temp:   32.1 (F)
               Anti-tam. Program: No       Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC  All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 28.3   28.3   28.3          28.3   28.3   28.3   28.3   28.3
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 20.88  29.32  41.16  32.04  14.32   1.19   1.30   7.55   0.00  23.64
 _______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
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0Cal. Year: 2015        Region: High         Altitude: 5500. Ft.
              I/M Program: No         Ambient Temp:   32.1 (F)
        Anti-tam. Program: No       Operating Mode:   44.8 / 19.7 / 47.0
         Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC  All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 28.3   28.3   28.3           28.3   28.3   28.3   28.3   28.3
  VMT Mix:  0.637  0.238  0.071          0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 20.88  29.37  41.31  32.12  27.87   1.19   2.10  12.50   0.00  24.02
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015        Region: Low          Altitude:  500. Ft.
              I/M Program: No         Ambient Temp:   32.1 (F)
        Anti-tam. Program: No       Operating Mode:   44.8 / 19.7 / 47.0
         Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC  All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 25.5   25.5   25.5           25.5   25.5   25.5   25.5   25.5
  VMT Mix:  0.637  0.238  0.071          0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 23.86  33.07  46.43  36.14  15.96   1.33   1.45   8.42   0.00  26.85
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015        Region: High         Altitude: 5500. Ft.
              I/M Program: No         Ambient Temp:   32.1 (F)
        Anti-tam. Program: No       Operating Mode:   44.8 / 19.7 / 47.0
         Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC  All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 25.5   25.5   25.5           25.5   25.5   25.5   25.5   25.5
  VMT Mix:  0.637  0.238  0.071          0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 23.86  33.14  46.61  36.23  31.07   1.33   2.34  13.95   0.00  27.29
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015        Region: Low          Altitude:  500. Ft.
              I/M Program: No         Ambient Temp:   32.1 (F)
        Anti-tam. Program: No       Operating Mode:   44.8 / 19.7 / 47.0
         Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC  All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 17.3   17.3   17.3           17.3   17.3   17.3   17.3   17.3
  VMT Mix:  0.637  0.238  0.071          0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
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 Exhst  CO: 35.19  47.24  66.32  51.62  24.24   1.98   2.17  12.59   0.00  39.10
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0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015          Region: High          Altitude: 5500. Ft.
                  I/M Program: No         Ambient Temp:   32.1 (F)
            Anti-tam. Program: No       Operating Mode:   44.8 / 19.7 / 47.0
             Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 17.3   17.3   17.3           17.3   17.3   17.3   17.3   17.3
   VMT Mix:  0.637  0.238  0.071          0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 35.19  47.33  66.57  51.75  47.16   1.98   3.50  20.85   0.00  39.75
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CO 1998
W/ PROJECT

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1              PROMPT
MISSOULA CO 1998 w/PROJECT FACTORS USING MOBILE 5
1              TAMFLAG
1              SPEEDFLAG
2              VMFLAG
3              MYMRFG
1              NEWFLAG
1              IMFLAG
1              ALHFLG
1              ATPFLG
1              FLFLAG
2              LOCFLG
2              TEMFLG
4              OUTFMT
2              PRTFLG
1              IDLFLG
1              NMHFLG
1              HCFLAG
.061 .054 .054 .061 .063 .064 .068 .065 .062 .059       LDGV (1-10)
.054 .038 .030 .033 .032 .035 .031 .024 .017 .010       LDGV (11-20)
.010 .011 .010 .007 .047                                LDGV (21-25)
.059 .051 .045 .047 .044 .053 .051 .049 .062 .048       LDGT1 (1-10)
.051 .036 .026 .027 .028 .048 .048 .039 .030 .016       LDGT1 (11-20)
.019 .020 .016 .011 .076                                LDGT1 (21-25)
.051 .027 .028 .035 .051 .050 .044 .016 .031 .029       LDGT2 (1-10)
.030 .026 .018 .026 .025 .062 .062 .055 .048 .034       LDGT2 (11-20)
.035 .042 .040 .023 .112                                LDGT2 (21-25)
.036 .042 .035 .025 .026 .038 .026 .020 .027 .028       HDGV (1-10)
.023 .020 .017 .031 .028 .070 .052 .037 .029 .035       HDGV (11-20)
.040 .039 .025 .028 .223                                HDGV (21-25)
.061 .054 .054 .061 .063 .064 .068 .065 .062 .059       LDDV (1-10)
.054 .038 .030 .033 .032 .035 .031 .024 .017 .010       LDDV (11-10)
.010 .011 .010 .007 .047                                LDDV (21-25)
.059 .051 .045 .047 .044 .053 .051 .049 .062 .048       LDDT (1-10)
.051 .036 .026 .027 .028 .048 .048 .039 .030 .016       LDDT (11-20)
.019 .020 .016 .011 .076                                LDDT (21-25)
.175 .080 .049 .070 .074 .043 .063 .038 .039 .035       HDDV (1-10)
.022 .016 .015 .018 .028 .023 .026 .023 .014 .019       HDDV (11-20)
.017 .033 .016 .022 .052                                HDDV (21-25)
.023 .041 .024 .024 .021 .028 .020 .033 .045 .042       MC (1-10)
.049 .650 .000 .000 .000 .000 .000 .000 .000 .000       MC (11-20)
.000 .000 .000 .000 .000                                MC (21-25)
MISSOULA 1998     E 24.8 38.4 15.0 15.0 95 2
.800 .200 .027 .035  1
1 98 51.7 32.1 44.8 19.7 47.0                           FW LOW ALT
.637.238.071.020.006.011.017.000                        VMT MIX
2 98 51.7 32.1 44.8 19.7 47.0                           FW HIGH ALT
.637.238.071.020.006.011.017.000                        VMT MIX
1 98 29.6 32.1 44.8 19.7 47.0                           ARTERIAL LOW ALT
.637.238.071.020.006.011.017.000                        VMT MIX
2 98 29.6 32.1 44.8 19.7 47.0                           ARTERIAL HIGH ALT
.637.238.071.020.006.011.017.000                        VMT MIX
1 98 25.7 32.1 44.8 19.7 47.0                           COLLECTOR LOW ALT
.637.238.071.020.006.011.017.000                        VMT MIX
2 98 25.7 32.1 44.8 19.7 47.0                           COLLECTOR HIGH ALT
.637.238.071.020.006.011.017.000                        VMT MIX
1 98 16.9 32.1 44.8 19.7 47.0                           LOCAL LOW ALT
.637.238.071.020.006.011.017.000                        VMT MIX
2 98 16.9 32.1 44.8 19.7 47.0                           LOCAL HIGH ALT
.637.238.071.020.006.011.017.000                        VMT MIX
```

```
1MISSOULA CO 1998 w/PROJECT FACTORS USING MOBILE 5
 MOBILE5a (26-Mar-93)
0
-M 49 Warning:
+               1.01     MYR sum not = 1. (will normalize)
0MISSOULA 1998
                    Minimum Temp: 25. (F)   Maximum Temp: 38. (F)
                    Period 1 RVP: 15.0      Period 2 RVP: 15.0 Period 2 Yr: 1995
0Total HC emission factors include evaporative HC emission factors.
0_______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low          Altitude:  500. Ft.
                     I/M Program: No       Ambient Temp:   32.1 (F)
                 Anti-tam. Program: No     Operating Mode:   44.8 / 19.7 / 47.0
                  Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 51.7   51.7   51.7          51.7   51.7   51.7   51.7   51.7
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 17.83  25.85  41.13  29.36  48.54   1.03   1.15   5.70   0.00  21.52
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: High         Altitude: 5500. Ft.
                     I/M Program: No       Ambient Temp:   32.1 (F)
                 Anti-tam. Program: No     Operating Mode:   44.8 / 19.7 / 47.0
                  Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 51.7   51.7   51.7          51.7   51.7   51.7   51.7   51.7
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 19.82  32.39  66.09  40.13  71.73   1.35   2.44   9.33   0.00  26.66
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low          Altitude:  500. Ft.
                     I/M Program: No       Ambient Temp:   32.1 (F)
                 Anti-tam. Program: No     Operating Mode:   44.8 / 19.7 / 47.0
                  Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 29.6   29.6   29.6          29.6   29.6   29.6   29.6   29.6
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 28.33  38.13  59.75  43.10  58.66   1.41   1.57   7.77   0.00  32.70
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
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0Cal. Year: 1998          Region: High          Altitude: 5500. Ft.
                    I/M Program: No       Ambient Temp:    32.1 (F)
              Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 29.6   29.6   29.6          29.6   29.6   29.6   29.6   29.6
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 30.55  45.66  84.52  54.59  86.68   1.85   3.32  12.72   0.00  38.33
_________________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low           Altitude:  500. Ft.
                    I/M Program: No       Ambient Temp:    32.1 (F)
              Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 25.7   25.7   25.7          25.7   25.7   25.7   25.7   25.7
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 32.59  43.32  67.80  48.94  67.81   1.63   1.82   9.00   0.00  37.42
_________________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: High          Altitude: 5500. Ft.
                    I/M Program: No       Ambient Temp:    32.1 (F)
              Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 25.7   25.7   25.7          25.7   25.7   25.7   25.7   25.7
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 34.90  51.27  92.33  60.70 100.20   2.14   3.85  14.73   0.00  43.30
_________________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low           Altitude:  500. Ft.
                    I/M Program: No       Ambient Temp:    32.1 (F)
              Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 16.9   16.9   16.9          16.9   16.9   16.9   16.9   16.9
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
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 Exhst  CO: 46.92  60.66  97.23  69.07 106.35   2.52   2.81  13.87   0.00  53.64
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: High          Altitude: 5500. Ft.
                     I/M Program: No        Ambient Temp:    32.1 (F)
               Anti-tam. Program: No      Operating Mode:    44.8 / 19.7 / 47.0
                 Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC  All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 16.9   16.9   16.9          16.9   16.9   16.9   16.9   16.9
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 49.38  70.06 119.32  81.38 157.16   3.30   5.94  22.72   0.00  60.22
 ______________________________________________________________________________
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CO 2005
w/ Project

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1               PROMPT
MISSOULA CO 2005 W/PROJECT FACTORS USING MOBILE 5
1               TAMFLAG
1               SPEEDFLAG
2               VMFLAG
3               MYMRFG
1               NEWFLAG
1               IMFLAG
1               ALHFLG
1               ATPFLG
1               FLFLAG
2               LOCFLG
2               TEMFLG
4               OUTFMT
2               PRTFLG
1               IDLFLG
1               NMHFLG
1               HCFLAG
.061 .054 .054 .061 .063 .064 .068 .065 .062 .059        LDGV (1-10)
.054 .038 .030 .033 .032 .035 .031 .024 .017 .010        LDGV (11-20)
.010 .011 .010 .007 .047                                 LDGV (21-25)
.059 .051 .045 .047 .044 .053 .051 .049 .062 .048        LDGT1 (1-10)
.051 .036 .026 .027 .028 .048 .048 .039 .030 .016        LDGT1 (11-20)
.019 .020 .016 .011 .076                                 LDGT1 (21-25)
.051 .027 .028 .035 .051 .050 .044 .016 .031 .029        LDGT2 (1-10)
.030 .026 .018 .026 .025 .062 .062 .055 .048 .034        LDGT2 (11-20)
.035 .042 .040 .023 .112                                 LDGT2 (21-25)
.036 .042 .035 .025 .026 .038 .026 .020 .027 .028        HDGV (1-10)
.023 .020 .017 .031 .028 .070 .052 .037 .029 .035        HDGV (11-20)
.040 .039 .025 .028 .223                                 HDGV (21-25)
.061 .054 .054 .061 .063 .064 .068 .065 .062 .059        LDDV (1-10)
.054 .038 .030 .033 .032 .035 .031 .024 .017 .010        LDDV (11-10)
.010 .011 .010 .007 .047                                 LDDV (21-25)
.059 .051 .045 .047 .044 .053 .051 .049 .062 .048        LDDT (1-10)
.051 .036 .026 .027 .028 .048 .048 .039 .030 .016        LDDT (11-20)
.019 .020 .016 .011 .076                                 LDDT (21-25)
.175 .080 .049 .070 .074 .043 .063 .038 .039 .035        HDDV (1-10)
.022 .016 .015 .018 .028 .023 .026 .023 .014 .019        HDDV (11-20)
.017 .033 .016 .022 .052                                 HDDV (21-25)
.023 .041 .024 .024 .021 .028 .020 .033 .045 .042        MC (1-10)
.049 .650 .000 .000 .000 .000 .000 .000 .000 .000        MC (11-20)
.000 .000 .000 .000 .000                                 MC (21-25)
MISSOULA 2005     E 24.8 38.4 15.0 15.0 95 2
.800 .200 .027 .035  1
1 05 51.5 32.1 44.8 19.7 47.0                            FW LOW ALT
.637.238.071.020.006.011.017.000                         VMT MIX
2 05 51.5 32.1 44.8 19.7 47.0                            FW HIGH ALT
.637.238.071.020.006.011.017.000                         VMT MIX
1 05 29.5 32.1 44.8 19.7 47.0                            ARTERIAL LOW ALT
.637.238.071.020.006.011.017.000                         VMT MIX
2 05 29.5 32.1 44.8 19.7 47.0                            ARTERIAL HIGH ALT
.637.238.071.020.006.011.017.000                         VMT MIX
1 05 25.8 32.1 44.8 19.7 47.0                            COLLECTOR LOW ALT
.637.238.071.020.006.011.017.000                         VMT MIX
2 05 25.8 32.1 44.8 19.7 47.0                            COLLECTOR HIGH ALT
.637.238.071.020.006.011.017.000                         VMT MIX
1 05 17.0 32.1 44.8 19.7 47.0                            LOCAL LOW ALT
.637.238.071.020.006.011.017.000                         VMT MIX
2 05 17.0 32.1 44.8 19.7 47.0                            LOCAL HIGH ALT
.637.238.071.020.006.011.017.000                         VMT MIX
```

```
1MISSOULA CO 2005 w/PROJECT FACTORS USING MOBILE 5
 MOBILE5a (26-Mar-93)
0
-M 49 Warning:
+            1.01     MYR sum not = 1. (will normalize)
0MISSOULA 2005
                   Minimum Temp: 25. (F)   Maximum Temp: 38. (F)
                   Period 1 RVP: 15.0      Period 2 RVP: 15.0 Period 2 Yr: 1995
0Total HC emission factors include evaporative HC emission factors.
0_____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: Low           Altitude:  500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                 Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 51.5   51.5   51.5          51.5   51.5   51.5   51.5   51.5
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 12.02  17.66  27.32  19.88  21.20   0.91   0.95   5.41   0.00  14.33
 _____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: High          Altitude: 5500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                 Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 51.5   51.5   51.5          51.5   51.5   51.5   51.5   51.5
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 12.15  19.11  31.04  21.85  33.59   1.07   1.74   8.94   0.00  15.34
 _____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: Low           Altitude:  500. Ft.
                     I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                 Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 29.5   29.5   29.5          29.5   29.5   29.5   29.5   29.5
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 21.88  29.25  40.85  31.91  25.78   1.24   1.30   7.41   0.00  24.46
 _____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
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0Cal. Year: 2005          Region: High          Altitude: 5500. Ft.
                    I/M Program: No        Ambient Temp:    32.1 (F)
               Anti-tam. Program: No      Operating Mode:    44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                         Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 29.5   29.5   29.5           29.5   29.5   29.5   29.5   29.5
   VMT Mix:  0.637  0.238  0.071          0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 22.05  31.01  45.30  34.30  40.85   1.46   2.39  12.24   0.00  25.70
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: Low           Altitude:  500. Ft.
                    I/M Program: No        Ambient Temp:    32.1 (F)
               Anti-tam. Program: No      Operating Mode:    44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                         Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 25.8   25.8   25.8           25.8   25.8   25.8   25.8   25.8
   VMT Mix:  0.637  0.238  0.071          0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 25.55  33.56  45.88  36.39  29.59   1.43   1.49   8.51   0.00  28.28
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: High          Altitude: 5500. Ft.
                    I/M Program: No        Ambient Temp:    32.1 (F)
               Anti-tam. Program: No      Operating Mode:    44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                         Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 25.8   25.8   25.8           25.8   25.8   25.8   25.8   25.8
   VMT Mix:  0.637  0.238  0.071          0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 25.73  35.44  50.60  38.93  46.88   1.68   2.75  14.07   0.00  29.64
 ______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: Low           Altitude:  500. Ft.
                    I/M Program: No        Ambient Temp:    32.1 (F)
               Anti-tam. Program: No      Operating Mode:    44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                         Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 17.0   17.0   17.0           17.0   17.0   17.0   17.0   17.0
   VMT Mix:  0.637  0.238  0.071          0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
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 Exhst  CO: 37.69  47.90  63.84  51.56  46.31   2.20   2.30  13.11   0.00  41.13
_____________________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2005          Region: High          Altitude: 5500. Ft.
                     I/M Program: No         Ambient Temp:   32.1 (F)
                 Anti-tam. Program: No       Operating Mode:   44.8 / 19.7 / 47.0
                  Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                             Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 17.0   17.0   17.0          17.0   17.0   17.0   17.0   17.0
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 37.94  50.35  69.97  54.86  73.38   2.59   4.23  21.67   0.00  43.02
_____________________________________________________________________________________
```

CO 2015 w/ Project

```
1              PROMPT
MISSOULA CO 2015 W/PROJECT FACTORS USING MOBILE 5
1              TAMFLAG
1              SPEEDFLAG
2              VMFLAG
3              MYMRFG
1              NEWFLAG
1              IMFLAG
1              ALHFLG
1              ATPFLG
1              FLFLAG
2              LOCFLG
2              TEMFLG
4              OUTFMT
2              PRTFLG
1              IDLFLG
1              NMHFLG
1              HCFLAG
.061 .054 .054 .061 .063 .064 .068 .065 .062 .059          LDGV (1-10)
.054 .038 .030 .033 .032 .035 .031 .024 .017 .010          LDGV (11-20)
.010 .011 .010 .007 .047                                   LDGV (21-25)
.059 .051 .045 .047 .044 .053 .051 .049 .062 .048          LDGT1 (1-10)
.051 .036 .026 .027 .028 .048 .048 .039 .030 .016          LDGT1 (11-20)
.019 .020 .016 .011 .076                                   LDGT1 (21-25)
.051 .027 .028 .035 .051 .050 .044 .016 .031 .029          LDGT2 (1-10)
.030 .026 .018 .026 .025 .062 .062 .055 .048 .034          LDGT2 (11-20)
.035 .042 .040 .023 .112                                   LDGT2 (21-25)
.036 .042 .035 .025 .026 .038 .026 .020 .027 .028          HDGV (1-10)
.023 .020 .017 .031 .028 .070 .052 .037 .029 .035          HDGV (11-20)
.040 .039 .025 .028 .223                                   HDGV (21-25)
.061 .054 .054 .061 .063 .064 .068 .065 .062 .059          LDDV (1-10)
.054 .038 .030 .033 .032 .035 .031 .024 .017 .010          LDDV (11-10)
.010 .011 .010 .007 .047                                   LDDV (21-25)
.059 .051 .045 .047 .044 .053 .051 .049 .062 .048          LDDT (1-10)
.051 .036 .026 .027 .028 .048 .048 .039 .030 .016          LDDT (11-20)
.019 .020 .016 .011 .076                                   LDDT (21-25)
.175 .080 .049 .070 .074 .043 .063 .038 .039 .035          HDDV (1-10)
.022 .016 .015 .018 .028 .023 .026 .023 .014 .019          HDDV (11-20)
.017 .033 .016 .022 .052                                   HDDV (21-25)
.023 .041 .024 .024 .021 .028 .020 .033 .045 .042          MC (1-10)
.049 .650 .000 .000 .000 .000 .000 .000 .000 .000          MC (11-20)
.000 .000 .000 .000 .000                                   MC (21-25)
MISSOULA 2015     E 24.8 38.4 15.0 15.0 95 2
.800 .200 .027 .035  1
1 15 51.3 32.1 44.8 19.7 47.0                              FW LOW ALT
.637.238.071.020.006.011.017.000                           VMT MIX
2 15 51.3 32.1 44.8 19.7 47.0                              FW HIGH ALT
.637.238.071.020.006.011.017.000                           VMT MIX
1 15 29.1 32.1 44.8 19.7 47.0                              ARTERIAL LOW ALT
.637.238.071.020.006.011.017.000                           VMT MIX
2 15 29.1 32.1 44.8 19.7 47.0                              ARTERIAL HIGH ALT
.637.238.071.020.006.011.017.000                           VMT MIX
1 15 25.6 32.1 44.8 19.7 47.0                              COLLECTOR LOW ALT
.637.238.071.020.006.011.017.000                           VMT MIX
2 15 25.6 32.1 44.8 19.7 47.0                              COLLECTOR HIGH ALT
.637.238.071.020.006.011.017.000                           VMT MIX
1 15 17.2 32.1 44.8 19.7 47.0                              LOCAL LOW ALT
.637.238.071.020.006.011.017.000                           VMT MIX
2 15 17.2 32.1 44.8 19.7 47.0                              LOCAL HIGH ALT
.637.238.071.020.006.011.017.000                           VMT MIX
```

```
1MISSOULA CO 2015 w/PROJECT FACTORS USING MOBILE 5
 MOBILE5a (26-Mar-93)
0
-M 49 Warning:
+         1.01    MYR sum not = 1. (will normalize)
0MISSOULA 2015
                    Minimum Temp: 25. (F)   Maximum Temp: 38. (F)
                    Period 1 RVP: 15.0      Period 2 RVP: 15.0 Period 2 Yr: 1995
0Total HC emission factors include evaporative HC emission factors.
0______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015          Region: Low          Altitude:  500. Ft.
                    I/M Program: No       Ambient Temp:   32.1 (F)
              Anti-tam. Program: No     Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 51.3   51.3   51.3          51.3   51.3   51.3   51.3   51.3
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO:  9.73  15.27  21.44  16.69  11.26   0.83   0.91   5.28   0.00  11.69
 _____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015          Region: High         Altitude: 5500. Ft.
                    I/M Program: No       Ambient Temp:   32.1 (F)
              Anti-tam. Program: No     Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 51.3   51.3   51.3          51.3   51.3   51.3   51.3   51.3
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO:  9.73  15.30  21.52  16.73  21.92   0.83   1.47   8.74   0.00  11.98
 _____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015          Region: Low          Altitude:  500. Ft.
                    I/M Program: No       Ambient Temp:   32.1 (F)
              Anti-tam. Program: No     Operating Mode:   44.8 / 19.7 / 47.0
                Reformulated Gas: No
0  Ether Blend Market Share: 0.800       Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027     Alcohol Blend Oxygen Content: 0.035
                                           Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 29.1   29.1   29.1          29.1   29.1   29.1   29.1   29.1
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 20.13  28.38  39.84  31.01  13.92   1.15   1.27   7.33   0.00  22.83
 _____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
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```
0Cal. Year: 2015          Region: High        Altitude: 5500. Ft.
                 I/M Program: No        Ambient Temp:   32.1 (F)
            Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
              Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                        Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 29.1   29.1   29.1          29.1   29.1   29.1   29.1   29.1
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 20.13  28.43  39.98  31.08  27.10   1.15   2.04  12.15   0.00  23.21
 _______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015          Region: Low         Altitude:  500. Ft.
                 I/M Program: No        Ambient Temp:   32.1 (F)
            Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
              Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                        Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 25.6   25.6   25.6          25.6   25.6   25.6   25.6   25.6
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 23.74  32.93  46.23  35.98  15.90   1.32   1.45   8.38   0.00  26.73
 _______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015          Region: High        Altitude: 5500. Ft.
                 I/M Program: No        Ambient Temp:   32.1 (F)
            Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
              Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                        Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 25.6   25.6   25.6          25.6   25.6   25.6   25.6   25.6
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 23.74  32.99  46.40  36.07  30.94   1.32   2.33  13.89   0.00  27.16
 _______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015          Region: Low         Altitude:  500. Ft.
                 I/M Program: No        Ambient Temp:   32.1 (F)
            Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
              Reformulated Gas: No
0  Ether Blend Market Share: 0.800      Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027    Alcohol Blend Oxygen Content: 0.035
                                        Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 17.2   17.2   17.2          17.2   17.2   17.2   17.2   17.2
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
```

```
 Exhst  CO: 35.29  47.37  66.50  51.77  24.38   1.99   2.19  12.66   0.00  39.22
 _____________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 2015            Region: High          Altitude: 5500. Ft.
                      I/M Program: No        Ambient Temp:   32.1 (F)
                Anti-tam. Program: No      Operating Mode:   44.8 / 19.7 / 47.0
                  Reformulated Gas: No
0  Ether Blend Market Share: 0.800         Alcohol Blend Market Share: 0.200
 Ether Blend Oxygen Content: 0.027      Alcohol Blend Oxygen Content: 0.035
                                          Alcohol Blend RVP Waiver: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 17.2   17.2   17.2          17.2   17.2   17.2   17.2   17.2
   VMT Mix:  0.637  0.238  0.071         0.020  0.006  0.011  0.017  0.000
0Composite Emission Factors (Gm/Mile)
 Exhst  CO: 35.29  47.46  66.75  51.89  47.45   1.99   3.52  20.97   0.00  39.87
 _____________________________________________________________________________
```

CO SPREADSHEET

```
A:A1:    'SPREADSHEET TO CALCULATE CO EMISSIONS FOR MISSOULA
A:A3:    'RUN:
A:B3:    '1990 URBAN
A:A6:    'ROAD TYPE
A:B6:    'VMT
A:C6:    'EMF
A:D6:    'EMISSION
A:A7:    'FREEWAY
A:B7:    15085
A:C7:    59.69
A:D7:    (B7*C7)/453
A:A8:    'ARTERIAL
A:B8:    357898
A:C8:    102.58
A:D8:    (B8*C8)/453
A:A9:    'COLLECTOR
A:B9:    64903
A:C9:    110.99
A:D9:    (B9*C9)/453
A:A10:   'LOCAL
A:B10:   94517
A:C10:   109.75
A:D10:   (B10*C10)/453
A:D12:   @SUM(D7..D11)
```

SPREADSHEET TO CALCULATE CO EMISSIONS FOR MISSOULA

RUN: 1990 URBAN

ROAD TYPE	VMT	EMF	EMISSION
FREEWAY	15085	59.69	1987.7
ARTERIAL	357898	102.58	81044.5
COLLECTOR	64903	110.99	15902.0
LOCAL	94517	109.75	22899.0
			121833.2

SPREADSHEET TO CALCULATE CO EMISSIONS FOR MISSOULA

RUN: 1990 RURAL

ROAD TYPE	VMT	EMF	EMISSION
FREEWAY	72217	185.74	29610.6
ARTERIAL	185189	72.59	29675.2
COLLECTOR	9727	78.36	1682.6
LOCAL	31381	96.44	6680.8
			67649.1

SPREADSHEET TO CALCULATE CO EMISSIONS FOR MISSOULA

RUN: 2005 WITHOUT PROJECT (10/18)

ROAD TYPE	VMT	EMF	EMISSION
FREEWAY	71090	14.84	2328.9
ARTERIAL	624263	25.55	35209.5
COLLECTOR	117059	28.96	7483.5
LOCAL	97433	42.08	9050.7
			54072.6

SPREADSHEET TO CALCULATE CO EMISSIONS FOR MISSOULA

RUN: 2005 WITH PROJECT (10/18)

ROAD TYPE	VMT	EMF	EMISSION
FREEWAY	71735	14.84	2350.0
ARTERIAL	628291	25.08	34784.9
COLLECTOR	118206	28.96	7556.8
LOCAL	98224	42.08	9124.2
			53815.9

SPREADSHEET TO CALCULATE CO EMISSIONS FOR MISSOULA

RUN: 2015 WITHOUT PROJECT (10/18)

ROAD TYPE	VMT	EMF	EMISSION
FREEWAY	87049	11.84	2275.2
ARTERIAL	713879	23.83	37553.5
COLLECTOR	145547	27.07	8697.5
LOCAL	116841	39.43	10170.1
			58696.2

SPREADSHEET TO CALCULATE CO EMISSIONS FOR MISSOULA

RUN: 2015 WITH PROJECT (10/18)

ROAD TYPE	VMT	EMF	EMISSION
FREEWAY	87249	11.84	2280.4
ARTERIAL	721187	23.02	36648.4
COLLECTOR	144379	26.95	8589.4
LOCAL	115607	39.54	10090.7
			57609.0

MISSOULA MODEL RESULTS SUMMARY - M9494E00 1994 BASE CASE

AREA	Variable	Total	Freeway	Pr. Art.	Arterial	Collector	Local
PM-10 NONATTAINMENT	VHT (hours)	27,292	1,033	13,976	3,720	3,625	4,937
CO NONATTAINMENT		28,368	1,196	14,198	4,198	3,697	5,079
WASHED SAND AREA		25,124	929	13,697	2,908	3,168	4,422
MISSOULA STUDY AREA		41,402	5,178	18,663	5,941	4,629	6,992
PM-10 NONATTAINMENT	VMT (veh-mi)	724,433	52,448	390,276	110,444	92,090	79,175
CO NONATTAINMENT		765,984	59,141	399,680	130,596	94,992	81,575
WASHED SAND AREA		660,502	47,200	382,688	80,962	78,689	70,964
MISSOULA STUDY AREA		1,358,836	276,076	622,382	210,938	127,898	121,542
PM-10 NONATTAINMENT	Vehicle Speed	28.5	52.8	27.9	29.7	25.4	16.8
CO NONATTAINMENT		29.0	51.9	28.2	31.1	25.7	16.9
WASHED SAND AREA		28.1	52.8	27.9	27.8	24.8	16.9
MISSOULA STUDY AREA		36.1	54.5	33.3	35.5	27.6	18.6

Source : Missoula Transportation Plan Model Validation Run results
with "Existing" 1994 land use and 1994 roadway network (M9494E00)

MISSOULA MODEL RESULTS SUMMARY - M0505A01 2005 PROJECT

AREA	Variable	Total	Freeway	Pr. Art.	Arterial	Collector	Local
PM-10 NONATTAINMENT	VHT (hours)	32,506	1,238	16,738	4,289	4,429	5,813
CO NONATTAINMENT		33,996	1,468	17,026	4,864	4,584	6,055
WASHED SAND AREA		29,864	1,119	16,367	3,318	3,862	5,198
MISSOULA STUDY AREA		50,525	6,424	22,567	6,869	6,107	8,559
PM-10 NONATTAINMENT	VMT (veh-mi)	861,312	62,423	466,102	126,615	112,117	94,056
CO NONATTAINMENT		916,457	71,735	478,350	149,941	118,206	98,224
WASHED SAND AREA		784,348	56,460	456,641	91,682	95,282	84,284
MISSOULA STUDY AREA		1,653,721	341,366	752,029	240,457	169,219	150,651
PM-10 NONATTAINMENT	Vehicle Speed	28.4	52.6	27.8	29.5	25.3	17.0
CO NONATTAINMENT		28.9	51.5	28.1	30.8	25.8	17.0
WASHED SAND AREA		28.1	52.6	27.9	27.6	24.7	17.1
MISSOULA STUDY AREA		36.0	54.4	33.3	35.0	27.7	18.8

Source : Missoula Transportation Plan Model results with "Future" 2005 land use and assumed "Future" 2005 roadway network (M0505A01)

MISSOULA MODEL RESULTS SUMMARY - M0594C00 2005 NO PROJECT

AREA	Variable	Total	Freeway	Pr. Art.	Arterial	Collector`	Local
PM-10 NONATTAINMENT		32,749	1,228	16,956	4,384	4,409	5,773
CO NONATTAINMENT	VHT	34,251	1,456	17,241	5,002	4,538	6,014
WASHED SAND AREA	(hours)	30,109	1,109	16,589	3,415	3,837	5,159
MISSOULA STUDY AREA		50,873	6,379	22,767	7,036	6,113	8,578
PM-10 NONATTAINMENT		854,789	61,774	459,451	128,340	111,955	93,268
CO NONATTAINMENT	VMT	909,845	71,090	471,184	153,079	117,059	97,433
WASHED SAND AREA	(veh-mi)	777,936	55,816	450,067	93,461	95,094	83,498
MISSOULA STUDY AREA		1,649,214	338,834	744,261	244,646	169,432	152,041
PM-10 NONATTAINMENT		27.9	52.5	27.1	29.3	25.4	17.0
CO NONATTAINMENT	Vehicle	28.5	51.5	27.3	30.6	25.8	17.0
WASHED SAND AREA	Speed	27.6	52.5	27.1	27.4	24.8	17.1
MISSOULA STUDY AREA		35.7	54.4	32.7	34.8	27.7	19.0

Source : Missoula Transportation Plan Model results with "Future" 2005 land use and "Existing" 1994 roadway network plus "Committed" projects outside of the Non-Attainment areas (M0594C00)

MISSOULA MODEL RESULTS SUMMARY - M1594C00 2015 NO PROJECT

AREA	Variable	Total	Freeway	Pr. Art.	Arterial	Collector	Local
PM-10 NONATTAINMENT	VHT (hours)	38,962	1,501	20,366	4,899	5,442	6,753
CO NONATTAINMENT		40,967	1,795	20,751	5,678	5,640	7,103
WASHED SAND AREA		35,880	1,359	19,881	3,814	4,780	6,046
MISSOULA STUDY AREA		61,968	7,946	27,745	8,216	7,756	10,304
PM-10 NONATTAINMENT	VMT (veh-mi)	990,838	75,213	526,306	142,622	135,915	110,782
CO NONATTAINMENT		1,061,317	87,049	541,362	172,517	143,547	116,841
WASHED SAND AREA		902,940	68,137	515,112	103,797	116,415	99,479
MISSOULA STUDY AREA		1,984,884	421,527	880,959	286,081	211,051	185,266
PM-10 NONATTAINMENT	Vehicle Speed	27.3	52.4	25.8	29.1	25.0	17.3
CO NONATTAINMENT		27.8	51.3	26.1	30.4	25.5	17.3
WASHED SAND AREA		26.9	52.4	25.9	27.2	24.4	17.4
MISSOULA STUDY AREA		35.3	54.3	31.8	34.8	27.2	19.3

Source : Missoula Transportation Plan Model results with "Future" 2015 land use and "Existing" 1994 roadway network plus "Committed" projects outside of the Non-Attainment areas (M1594C00)

MISSOULA MODEL RESULTS SUMMARY - M1515R02 2015 PROJECT

AREA	Variable	Total	Freeway	Pr. Art.	Arterial	Collector	Local
PM-10 NONATTAINMENT		37,943	1,502	19,462	4,891	5,396	6,693
CO NONATTAINMENT	VHT	39,903	1,800	19,837	5,590	5,631	7,044
WASHED SAND AREA	(hours)	34,874	1,359	19,000	3,793	4,737	5,985
MISSOULA STUDY AREA		60,845	7,982	26,835	8,042	7,753	10,232
PM-10 NONATTAINMENT		997,945	75,431	535,593	142,100	135,291	109,530
CO NONATTAINMENT	VMT	1,068,422	87,249	551,470	169,717	144,379	115,607
WASHED SAND AREA	(veh-mi)	909,953	68,334	524,493	103,025	115,875	98,226
MISSOULA STUDY AREA		1,991,874	423,413	891,443	280,083	213,445	183,490
PM-10 NONATTAINMENT		28.2	52.5	27.5	29.1	25.1	17.2
CO NONATTAINMENT	Vehicle	28.7	51.3	27.8	30.4	25.6	17.2
WASHED SAND AREA	Speed	27.9	52.5	27.6	27.2	24.5	17.3
MISSOULA STUDY AREA		36.0	54.3	33.2	34.8	27.5	19.2

Source : Missoula Transportation Plan Model results with "Future" 2015 land use and "Future" 2015 Recommended Plan #2 roadway network (M1515R02).

MISSOULA MODEL RESULTS SUMMARY FOR DE-ICER AREA

MODEL RUN SCENARIO	Variable	Freeway	Pr. Art.	Arterial	Collector	Ramp
M9494E00	Vehicle Miles of Road	38.86	45.13	34.25	84.87	4.70
M0594C00		38.86	45.13	34.25	89.40	5.33
M0505A01		38.86	45.49	34.25	93.05	5.33
M1594C00		38.86	45.13	34.25	89.40	5.33
M1515R02		38.86	45.30	34.25	94.00	5.33

Source : Various Missoula Transportation Plan Model run results with 1994, 2005 and 2015 land use and Existing, E+C, 2005 Alternative #1, and 2015 Recommended Plan #2 roadway networks.

Montana Street Sampling Data

PM-10*

City	Road Type - Location	Silt Content (%)	Ttl Pvd Srfc Ld (gm/m2)	Silt Load (gm/m2)	Sample Date	Emission Factor (kg/VKT)
Missoula	Pvd Clctr - Russell N of Broadway (VB #2)	50.0	11.7	5.8291	29-Nov-91	0.0092
Missoula	Sherwood W of Burns (VB #3)	50.8	6.8	3.4393	29-Nov-91	0.0065
Missoula	Pvd Clctr - Toole W of Scott (VB # 1)	28.9	15.4	4.4447	29-Nov-91	0.0077
Missoula	Pvd Clctr - 3rd btwn Prince & Inez	13.1	15.7	2.1	04-Jun-92	0.0047
Missoula	Pvd Local - Inez btwn 4th & 5th	17.4	5.7	1.0	04-Jun-92	0.0029
Missoula	Pvd Artrl - Russell btwn 3rd & 4th	14.0	108.4	15.2	04-Jun-92	0.0172
Missoula	Pvd Artrl - Russell N of Ernest	31.8	3.4	1.1	25-Oct-92	0.0031
Missoula	Pvd Artrl - Russell btwn 3rd & 4th	16.4	36.9	6.1	25-Oct-92	0.0094
Missoula	Pvd Clctr - 3rd btwn Prince & Inez	21.4	10.9	2.3	25-Oct-92	0.0051
Missoula	Pvd Artrl - Russell N of Ernest (VB #126)	23.3	3.4	0.7829	25-Oct-92	0.0025
Missoula	Pvd Clctr - Woody btwn Spruce & Alder	22.3	12.7	2.8	27-Nov-92	0.0058
Missoula	Pvd Clctr - Bancroft btwn Salish & Benton	8.0	20.3	1.6	27-Nov-92	0.0040
Missoula	Pvd Clctr - Spruce btwn Woody & Ryman	14.4	53.2	7.7	27-Nov-92	0.0110
Missoula	Pvd Local - Inez btwn 4th St & 5th St	22.0	7.5	1.7	27-Nov-92	0.0041
Missoula	Pvd Clctr - Ernest btwn Sunrise & Washburn	8.3	21.9	1.8	27-Nov-92	0.0043
Missoula	Pvd Clctr - Ernest btwn Sunrise & Washburn (VB# 169)	6.4	55.3	3.5384	11-Mar-93	0.0067
Missoula	Pvd Clctr - Bancroft btwn Salish & Benton (VB #172)	16.2	14.5	2.3565	11-Mar-93	0.0051
Missoula	Pvd Clctr - Woody btwn Spruce & Alder (VB# 173)	13.4	46.5	6.2277	11-Mar-93	0.0096
Missoula	Pvd Clctr - 3rd btwn Prince & Inez (VB #171)	18.0	48.7	8.7581	11-Mar-93	0.0120
Missoula	Pvd Clctr - Spruce btwn Woody & Ryman (VB #174)	13.8	67.1	9.2618	11-Mar-93	0.0125
Missoula	Pvd Local - Inez btwn 4th & 5th (VB #170)	16.2	31.4	5.0855	11-Mar-93	0.0084
Missoula	Pvd Artrl - Russell N of Ernest (VB #166)	21.0	4.1	0.8687	16-Mar-93	0.0027
Missoula	Pvd Artrl - Russell btwn 3rd & 4th (VB # 168)	10.8	47.2	5.0952	16-Mar-93	0.0084

* Notes: Silt loadings are calculated from 1995 AP-42 emission factor equations / Conversion Factors: 0.093 m2 = 1 ft2 and 1 gm = 15.3 grains

Montana Street Sampling Data

City	Road Type - Location	Silt Content (%)	Ttl Pvd Srfc Ld (gm/m2)	Silt Load (gm/m2)	Sample Date	PM-10* Emission Factor (kg/VKT)
Missoula	Pvd Clctr - Woody btwn Spruce & Alder (VB# 265)	7.5	15.9	1.1962	19-Sep-93	0.0033
Missoula	Pvd Clctr - Spruce btwn Woody & Ryman (VB #266)	7.7	26.3	2.0250	19-Sep-93	0.0046
Missoula	Pvd Artrl - Russell N of Ernest (VB #267)	8.8	4.9	0.4337	19-Sep-93	0.0017
Missoula	Pvd Clctr - Spruce btwn Woody & Ryman (VB #284)	9.1	59.5	5.4178	25-Mar-94	0.0088
Missoula	Pvd Clctr - Woody btwn Spruce & Alder (VB# 283)	9.7	13.5	1.3118	25-Mar-94	0.0035
Missoula	Pvd Artrl - Russell N of Ernest (VB #285)	16.2	8.6	1.3935	25-Mar-94	0.0036
Missoula	Pvd Clctr - Woody btwn Spruce & Alder (VB# 128)	11.3	9.4	1.0640	16-Mar-95	0.0031
Missoula	Pvd Artrl - Russell N of Ernest (VB #127)	19.4	9.3	1.7985	16-Mar-95	0.0043
Missoula	Pvd Clctr - Spruce btwn Woody & Ryman (VB #129)	9.7	29.1	2.8196	16-Mar-95	0.0058
Missoula	Pvd Clctr - Woody btwn Spruce & Alder (VB# 151)	17.8	16.9	3.0097	06-Oct-95	0.0060
Missoula	Pvd Artrl - Russell N of Ernest (VB #153)	9.3	3.4	0.3188	06-Oct-95	0.0014
Missoula	Pvd Clctr - Woody btwn Spruce & Alder (VB# 152)	6.2	11.3	0.7035	06-Oct-95	0.0023
Thompson Falls	Clctr (major) - Highway 200	27.2	122.2	33.2	23-Jan-91	0.0286
Thompson Falls	Local - Preston	9.9	93.0	9.2	23-Jan-91	0.0124
Thompson Falls	Local - Preston	17.9	199.7	35.7	25-Feb-91	0.0300
Thompson Falls	Clctr (major) - Highway 200	17.8	375.4	66.8	25-Feb-91	0.0450
Thompson Falls	Local - Preston	9.1	64.9	5.9	14-Mar-91	0.0093

* Notes: Silt loadings are calculated from 1995 AP-42 emission factor equations / Conversion Factors: 0.093 m2 = 1 ft2 and 1 gm = 15.3 grains

Montana Street Sampling Data

PM-10*

City	Road Type - Location	Silt Content (%)	Ttl Pvd Srfc Ld (gm/m2)	Silt Load (gm/m2)	Sample Date	Emission Factor (kg/VKT)
Butte	Sand - county	3.3			Jan-89	
Butte	Sand - MDOH	4.0			Jan-89	
Butte	Res - So Park Ave (drvg)	10.9	25.5	2.8	Jun-89	0.0057
Butte	Artrl - Continental Dr (drvg)	3.6	197.6	7.2	Jun-89	0.0106
Butte	Res - Garfield Ave (drvg)	8.7	11.2	1.0	Jun-89	0.0029
Butte	Pvd Clctr - Texas btwn Argyle & Wall	15.4	6.4	1.0	13-Dec-90	0.0029
Butte	Pvd Clctr - Texas	11.0	10.9	1.2	21-Feb-91	0.0033
Butte	Arterial - Harrison	7.9	36.6	2.9	21-Feb-91	0.0058
Butte	Arterial - Harrison	28.2	5.8	1.6	26-Jul-91	0.0040
Butte	Pvd Clctr - Texas	28.2	8.9	2.5	26-Jul-91	0.0053
Butte	Arterial - Harrison	23.1	9.1	2.1	03-Oct-91	0.0048
Butte	Pvd Clctr - Texas	17.7	5.4	1.0	03-Oct-91	0.0028
Butte	Arterial - Harrison	12.5	69.3	8.7	02-Feb-92	0.0119
Butte	Pvd Local - Argyle	28.5	76.8	21.9	02-Feb-92	0.0218
Butte	Pvd Clctr - Texas	12.2	164.5	20.1	02-Feb-92	0.0206
Butte	Pvd Local - Argyle (VB ** #310)	27.1	76.8	20.8	02-Feb-92	0.0211
Butte	Pvd Local - Argyle (VB #297)	9.8	788.7	77.3	02-Apr-93	0.0495
Butte	Pvd Clctr - Texas (VB # 295)	8.5	173.3	14.7	02-Apr-93	0.0168
Butte	Pvd Arterial - Harrison (VB #296)	3.5	427.5	15.0	09-Apr-93	0.0170
Butte	Pvd Minor Arterial - Continental Drive at Texas Inter. (VB # 3)	6.4	253.5	16.2	31-Mar-95	0.0179
Butte	Pvd Clctr - Wall St. and Texas Ave. Interchange (VB #1)	12.5	498.4	62.3	31-Mar-95	0.0430
Butte	Pvd Clctr - Texas Ave. at Wall St. (VB #2)	10.8	1362.2	147.1	31-Mar-95	0.0752

* Notes: Silt loadings are calculated from 1995 AP-42 emission factor equations / Conversion Factors: 0.093 m2 = 1 ft2 and 1 gm = 15.3 grains

```
A:A1:      'CALCULATION OF PM-10 EMISSION FACTOR  FOR PAVED ROADS
A:A3:      'STREET TYPE:
A:B3:      'ARTERIAL
A:A4:      'AREA:
A:B4:      'DE-ICER
A:A6:      'SILT LOAD:
A:B6:      4.297
A:A7:      'AVE. WEIGHT:
A:B7:      2.75
A:A9:      'EMISSION FACTOR
A:B9:      0.016*((B6/2)^0.65)*((B7/3)^1.5)
A:A10:     '(POUNDS/VMT)
```

CALCULATION OF PM-10 EMISSION FACTOR FOR PAVED ROADS

STREET TYPE: FREEWAY
AREA: ~~UNCONTROLLED~~ (ALL AREAS)

SILT LOAD: 0.1
AVE. WEIGHT: 5.2

EMISSION FACTOR (POUNDS/VMT) 0.005209

CALCULATION OF PM-10 EMISSION FACTOR FOR PAVED ROADS

STREET TYPE:	ARTERIAL
AREA:	NO CONTROL
SILT LOAD:	9.8976
AVE. WEIGHT:	2.75
EMISSION FACTOR (POUNDS/VMT)	0.039707

CALCULATION OF PM-10 EMISSION FACTOR FOR PAVED ROADS

STREET TYPE: ARTERIALS
AREA: WASHED SAND

SILT LOAD: 5.8
AVE. WEIGHT: 2.75

EMISSION FACTOR (POUNDS/VMT) 0.028054

CALCULATION OF PM-10 EMISSION FACTOR FOR PAVED ROADS

STREET TYPE: ARTERIAL
AREA: DE-ICER

SILT LOAD: 2.7624
AVE. WEIGHT: 2.75

EMISSION FACTOR (POUNDS/VMT) 0.017322

CALCULATION OF PM-10 EMISSION FACTOR FOR PAVED ROADS

STREET TYPE: COLLECTOR
AREA: NO CONTROLS

SILT LOAD: 6.69
AVE. WEIGHT: 2.2

EMISSION FACTOR 0.022026
(POUNDS/VMT)

CALCULATION OF PM-10 EMISSION FACTOR FOR PAVED ROADS

STREET TYPE: COLLECTOR
AREA: WASHED SAND

SILT LOAD: 3.8
AVE. WEIGHT: 2.2

EMISSION FACTOR (POUNDS/VMT) 0.01525

CALCULATION OF PM-10 EMISSION FACTOR FOR PAVED ROADS

STREET TYPE: COLLECTOR
AREA: DE-ICER

SILT LOAD: 4.5284
AVE. WEIGHT: 2.2

EMISSION FACTOR 0.017091
(POUNDS/VMT)

CALCULATION OF PM-10 EMISSION FACTOR FOR PAVED ROADS

STREET TYPE:	LOCAL
AREA:	UNCONTROLLED
SILT LOAD:	11.09
AVE. WEIGHT:	2
EMISSION FACTOR (POUNDS/VMT)	0.026517

CALCULATION OF PM-10 EMISSION FACTOR FOR PAVED ROADS

STREET TYPE: LOCAL
AREA: WASHED SAND

SILT LOAD: 6.3
AVE. WEIGHT: 2

EMISSION FACTOR 0.018361
(POUNDS/VMT)

CALCULATION OF PM-10 EMISSION FACTOR FOR PAVED ROADS

STREET TYPE:	LOCAL
AREA:	DE-ICER
SILT LOAD:	5.0855
AVE. WEIGHT:	2
EMISSION FACTOR (POUNDS/VMT)	0.015975

```
PART5 Revised 02-24-95
MISSOULA 1998 PM-10 VEHICLE EXHAUSTS

--------------------------------------------------------------------------------------------------------------
scene 1
Particle Size Cutoff 10.00 Microns             Altitude:  500. Ft.            Driving:  Cruise RFG:No
Cal. Year: 1998                                I/M Program: No                Region:   Low             All
  Veh. Type:  LDGV    LDGT1   LDGT2    HDGV     MC      LDDV    LDDT   2BHDDV  LHDDV   MHDDV   HHDDV   BUSES   Veh.
             ______  ______  ______  ______  ______  ______  ______  ______  ______  ______  ______  ______  ______
Veh. Speeds:  15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0
    VMT Mix: 0.6203  0.1864  0.0849  0.0309  0.0066  0.0019  0.0011  0.0123  0.0013  0.0157  0.0354  0.0032
Composite Emission Factors (g/mi)
 Exhaust PM: 0.013   0.017   0.026   0.121   0.020   0.238   0.274   0.206   0.894   0.796   0.928   0.788   0.070
 Brake:      0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.013
 Tire:       0.008   0.008   0.008   0.012   0.004   0.008   0.008   0.008   0.012   0.012   0.036   0.008   0.009
 Total PM:   0.056   0.067   0.077   0.200   0.046   0.290   0.333   0.289   1.017   0.942   1.125   0.953   0.124
--------------------------------------------------------------------------------------------------------------

Fugitive Dust: Unpaved Roads Fleet Average  106.41 g/mi (as calculated in AP42 Vol 1 9/88)*
                 Paved Roads Fleet Average   13.41 g/mi (as calculated in draft AP42 Vol 1 3/93)*
               Unpaved Roads Fleet Average  106.20 g/mi (as calculated in AP42 Vol 1 9/88, minus tailpipe and
                                                          tire-wear emissions)**
                 Paved Roads Fleet Average   13.21 g/mi (as calculated in draft AP42 Vol 1 3/93, minus tailpipe
                                                          and tire-wear emissions)**

*  Includes fleet average tailpipe, tire-wear and brake-wear emissions.
** Includes fleet average brake-wear emissions.

 Paved Road Silt:  5.10 (g/m^2)                         Fleet average vehicle weight:   6000
 Unpaved Silt:  4.3%                                    Fleet average number of wheels:  4
 Precipitation Days:  140 >0.01 in. (per year)
--------------------------------------------------------------------------------------------------------------
```

```
PART5 Revised 02-24-95
MISSOULA 2005 PM-10 VEHICLE EXHAUSTS
------------------------------------------------------------------------------------------------------------
scene 1
Particle Size Cutoff 10.00 Microns          Altitude:  500. Ft.            Driving:  Cruise RFG:No
Cal. Year: 2005                             I/M Program: No                Region:   Low
  Veh. Type:  LDGV   LDGT1   LDGT2   HDGV     MC    LDDV    LDDT   2BHDDV  LHDDV  MHDDV  HHDDV   BUSES    All
                                                                                                         Veh.
             ______  ______  ______  ______  ______  ______  ______  ______  ______  ______  ______  ______  ______

Veh. Speeds:  15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0
    VMT Mix: 0.6012  0.1965  0.0870  0.0312  0.0057  0.0017  0.0019  0.0138  0.0000  0.0184  0.0399  0.0028
Composite Emission Factors (g/mi)
 Exhaust PM: 0.013   0.015   0.015   0.069   0.020   0.116   0.129   0.116   0.000   0.372   0.431   0.323   0.041
 Brake:      0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.000   0.013   0.013   0.013   0.013
 Tire:       0.008   0.008   0.008   0.012   0.004   0.008   0.008   0.008   0.000   0.012   0.036   0.008   0.009
 Total PM:   0.056   0.065   0.066   0.143   0.046   0.165   0.186   0.196   0.000   0.513   0.617   0.476   0.095
------------------------------------------------------------------------------------------------------------

Fugitive Dust: Unpaved Roads Fleet Average  106.41 g/mi (as calculated in AP42 Vol 1 9/88)*
                 Paved Roads Fleet Average   13.41 g/mi (as calculated in draft AP42 Vol 1 3/93)*
               Unpaved Roads Fleet Average  106.20 g/mi (as calculated in AP42 Vol 1 9/88, minus tailpipe and
                                                        tire-wear emissions)**
                 Paved Roads Fleet Average   13.21 g/mi (as calculated in draft AP42 Vol 1 3/93, minus tailpipe
                                                        and tire-wear emissions)**

*  Includes fleet average tailpipe, tire-wear and brake-wear emissions.
** Includes fleet average brake-wear emissions.

 Paved Road Silt:  5.10 (g/m^2)                        Fleet average vehicle weight:   6000
 Unpaved Silt:  4.3%                                   Fleet average number of wheels:  4
 Precipitation Days:  140 >0.01 in. (per year)
------------------------------------------------------------------------------------------------------------
```

```
RT5 Revised 02-24-95
RT5 RUN FOR 2015, MISSOULA
------------------------------------------------------------------------------------------------------------------
ene1
rticle Size Cutoff 10.00 Microns              Altitude:  500. Ft.            Driving:  Cruise RFG:No
l. Year: 2015                                 I/M Program: No                Region:   Low              All
Veh. Type:  LDGV   LDGT1   LDGT2   HDGV    MC     LDDV    LDDT   2BHDDV  LHDDV   MHDDV   HHDDV   BUSES    Veh.
           ______  ______  ______  ______  ______  ______  ______  ______  ______  ______  ______  ______  ______
h. Speeds:  15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0    15.0
  VMT Mix: 0.5823  0.2039  0.0888  0.0330  0.0047  0.0019  0.0037  0.0152  0.0000  0.0203  0.0439  0.0023
mposite Emission Factors (g/mi)
xhaust PM: 0.012   0.015   0.015   0.044   0.020   0.100   0.109   0.093   0.000   0.218   0.267   0.160   0.032
rake:      0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.000   0.013   0.013   0.013   0.013
ire:       0.008   0.008   0.008   0.012   0.004   0.008   0.008   0.008   0.000   0.012   0.036   0.008   0.009
otal PM:   0.056   0.065   0.065   0.116   0.046   0.147   0.164   0.169   0.000   0.353   0.444   0.301   0.086
------------------------------------------------------------------------------------------------------------------

gitive Dust: Unpaved Roads Fleet Average  106.41 g/mi (as calculated in AP42 Vol 1 9/88)*
               Paved Roads Fleet Average   13.41 g/mi (as calculated in draft AP42 Vol 1 3/93)*
             Unpaved Roads Fleet Average  106.20 g/mi (as calculated in AP42 Vol 1 9/88, minus tailpipe and
                                                      tire-wear emissions)**
               Paved Roads Fleet Average   13.21 g/mi (as calculated in draft AP42 Vol 1 3/93, minus tailpipe
                                                      and tire-wear emissions)**

 Includes fleet average tailpipe, tire-wear and brake-wear emissions.
 Includes fleet average brake-wear emissions.

aved Road Silt:  5.10 (g/m^2)                         Fleet average vehicle weight:   6000
npaved Silt:  4.3%                                    Fleet average number of wheels:  4
recipitation Days:  140 >0.01 in. (per year)
------------------------------------------------------------------------------------------------------------------
```

PM-10 SPREADSHEET

```
A:A1:     'WORKSHEET TO CALCULATE PAVED ROAD PM-10 EMISSIONS
A:E1:     'YEAR:
A:F1:     '2015 no project
A:B3:     'DE-ICER /WASHED SAND AREA
A:C3:     'VMT
A:D3:     'EMISSION (LBS)
A:A4:     'ROAD TYPE
A:B4:     'PM-10 EMISSION FACTOR (LBS/VMT)
A:A6:     'FREEWAY
A:B6:     0.001051
A:C6:     61548
A:D6:     +B6*C6
A:A7:     'ARTERIAL
A:B7:     0.015536
A:C7:     540307
A:D7:     +B7*C7
A:A8:     'COLLECTOR
A:B8:     0.015448
A:C8:     88580
A:D8:     +B8*C8
A:A9:     'LOCAL
A:B9:     0.015975
A:C9:     50227
A:D9:     +B9*C9
A:C11:    @SUM(C6..C10)
A:D11:    @SUM(D6..D10)
A:B13:    'WASHED SAND AREA
A:C13:    'VMT
A:A15:    'ROAD TYPE
A:B15:    'PM-10 EMISSION FACTOR (LBS/VMT)
A:A17:    'FREEWAY
A:B17:    0.003607
A:C17:    6589
A:D17:    +B17*C17
A:A18:    'ARTERIAL
A:B18:    0.01867
A:C18:    78601
A:D18:    +B18*C18
A:A19:    'COLLECTOR
A:B19:    0.017021
A:C19:    27835
A:D19:    +B19*C19
A:A20:    'LOCAL
A:B20:    0.018361
A:C20:    49252
A:D20:    +B20*C20
A:C22:    @SUM(C17..C21)
A:D22:    @SUM(D17..D21)
A:B24:    'UNCONTROLLED AREA
A:C24:    'VMT
A:A26:    'ROAD TYPE
A:B26:    'PM-10 EMISSION FACTOR (LBS/VMT)
A:A28:    'FREEWAY
A:B28:    0.005209
A:C28:    7076
A:D28:    +B28*C28
A:A29:    'ARTERIAL
A:B29:    0.026942
A:C29:    50049
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A:D29:    +B29*C29
A:A30:    'COLLECTOR
A:B30:    0.02458
A:C30:    19500
A:D30:    +B30*C30
A:A31:    'LOCAL
A:B31:    0.026517
A:C31:    11303
A:D31:    +B31*C31
A:C33:    @SUM(C28..C32)
A:D33:    @SUM(D28..D32)
A:B35:    'TOTAL FOR NONATTAINMENT AREA:
A:C35:    +C11+C22+C33
A:D35:    +D11+D22+D33
```

WORKSHEET TO CALCULATE PAVED ROAD PM-10 EMISSIONS YEAR: 1998

ROAD TYPE	**DE-ICER /WASHED SAND AREA** PM-10 EMISSION FACTOR (LBS/VMT)	**VMT**	**EMISSION (LBS)**
FREEWAY	0.005209	46121	240.24
ARTERIAL	0.0114325	435568	4979.63
COLLECTOR	0.017091	65135	1113.22
LOCAL	0.015975	38632	617.15
		585456	6950.24

ROAD TYPE	**WASHED SAND AREA** PM-10 EMISSION FACTOR (LBS/VMT)	**VMT**	
FREEWAY	0.005209	4938	25.72
ARTERIAL	0.028054	63365	1777.64
COLLECTOR	0.01525	20468	312.14
LOCAL	0.018361	37882	695.55
		126653	2811.05

ROAD TYPE	**UNCONTROLLED AREA** PM-10 EMISSION FACTOR (LBS/VMT)	**VMT**	
FREEWAY	0.005209	5545	28.88
ARTERIAL	0.039707	40122	1593.12
COLLECTOR	0.022026	14832	326.69
LOCAL	0.026517	8862	234.99
		69361	2183.69

TOTAL FOR NONATTAINMENT AREA	781470	11944.99	**ROAD DUST**
		213.91	**TAILPIPE**
		12158.90	**TOTAL (LBS)**

TAILPIPE EMISSION CALCULATION:

VMT:	781470
EMISSION FACTOR (GRAM/MILE)	0.124
TAILPIPE EMISSION (GRAMS)	96902.28
TAILPIPE EMISSION (LBS)	213.91

WORKSHEET TO CALCULATE PAVED ROAD PM-10 EMISSIONS YEAR: 2005

DE-ICER /WASHED SAND AREA

ROAD TYPE	PM-10 EMISSION FACTOR (LBS/VMT)	VMT	EMISSION (LBS)
FREEWAY	0.005209	51000	265.66
ARTERIAL	0.0114325	478686	5472.58
COLLECTOR	0.017091	72500	1239.10
LOCAL	0.015975	42555	679.82
		644741	7657.15

WASHED SAND AREA

ROAD TYPE	PM-10 EMISSION FACTOR (LBS/VMT)	VMT	
FREEWAY	0.005209	5460	28.44
ARTERIAL	0.028054	69637	1953.60
COLLECTOR	0.01525	22782	347.43
LOCAL	0.018361	41729	766.19
		139608	3095.65

UNCONTROLLED AREA

ROAD TYPE	PM-10 EMISSION FACTOR (LBS/VMT)	VMT	
FREEWAY	0.005209	5963	31.06
ARTERIAL	0.039707	44394	1762.75
COLLECTOR	0.022026	16835	370.81
LOCAL	0.026517	9772	259.12
		76964	2423.75

TOTAL FOR NONATTAINMENT AREA	861313	13176.55	**ROAD DUST**
		180.63	**TAILPIPE**
		13357.17	**TOTAL (LBS)**

TAILPIPE EMISSION CALCULATION:

VMT:	861313
EMISSION FACTOR (GRAM/MILE)	0.095
TAILPIPE EMISSION (GRAMS)	81824.74
TAILPIPE EMISSION (LBS)	180.63

WORKSHEET TO CALCULATE PAVED ROAD PM-10 EMISSIONS YEAR: 2015

ROAD TYPE	**DE-ICER /WASHED SAND AREA** PM-10 EMISSION FACTOR (LBS/VMT)	**VMT**	**EMISSION (LBS)**
FREEWAY	0.005209	61726	321.53
ARTERIAL	0.011657	547823	6385.97
COLLECTOR	0.017091	88169	1506.90
LOCAL	0.015975	49594	792.26
		747312	9006.66

ROAD TYPE	**WASHED SAND AREA** PM-10 EMISSION FACTOR (LBS/VMT)	**VMT**	
FREEWAY	0.005209	6608	34.42
ARTERIAL	0.028054	79694	2235.74
COLLECTOR	0.01525	27705	422.50
LOCAL	0.018361	48632	892.93
		162639	3585.59

ROAD TYPE	**UNCONTROLLED AREA** PM-10 EMISSION FACTOR (LBS/VMT)	**VMT**	
FREEWAY	0.005209	7097	36.97
ARTERIAL	0.039707	50175	1992.30
COLLECTOR	0.022026	19416	427.66
LOCAL	0.026517	11304	299.75
		87992	2756.67

TOTAL FOR NONATTAINMENT AREA	997943	15348.93	**ROAD DUST**
		189.45	**TAILPIPE**
		15538.38	**TOTAL (LBS)**

TAILPIPE EMISSION CALCULATION:

VMT:	997943
EMISSION FACTOR (GRAM/MILE)	0.086
TAILPIPE EMISSION (GRAMS)	85823.1
TAILPIPE EMISSION (LBS)	189.45

SAMPLE CALCULATION

The following is an example calculation for determining PM_{10} emissions from arterials in the De-Icer/Washed Sand area for the year 2015.

Silt load values were collected from arterials in Missoula which were implementing the use of washed sand and de-icer prior to street sweeping. Samples from the "Spring" time period were used since this is typically the season of highest silt loading. Silt load samples were collected from Russell Street on these dates:[1]

Date	Silt Load (grams/square meter)
3-16-93	5.0952
3-25-93	1.3935
3-16-95	1.7985

The average silt load for these values is 2.7624 grams/square meter. Using the AP-42 (5th Edition) equation for determining emission factors:

$$e = k(sL/2)^{0.65}(W/3)^{1.5}$$

where e = PM10 Emission Factor (lbs/VMT)
k = 0.016
W = 2.75 tons
sL = 2.7624 grams/square meter

the calculated emission factor is 0.017322 lbs/VMT. Applying the 32.7% emissions reduction from street sweeping, the emission factor for arterials in the De-Icer/Washed Sand area is:

$$e = 0.017322\ (1-.327) = 0.022657\ \text{lbs/VMT}$$

The VMT predicted for the arterials in the De-Icer/Washed sand area for the year 2015 is 547,823.[2] This value is multiplied by the respective emission factor to get pounds of PM_{10} emitted from arterials in the De-Icer/Washed Sand area in the year 2015:

$$(0.011657\ \text{lb/VMT})\ (547{,}823\ \text{VMT}) = 6385.97\ \text{lbs}\ PM_{10}$$

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[1] See Montana Street Sampling Data, Appendix D5.

[2] See Transportation Model Outputs, Appendix D4.

Appendix E TDM Measures Proposed by the Consultant

E.1 List of TDM Strategies and Evidence of Their Effectiveness

TDM Strategies - As a first step in the TDM element of the plan update process, the TTAC/TPCC was presented a list of potential TDM strategies and their definitions. The strategies, divided into public sector strategies, private sector strategies, and implementation mechanisms, included:

Public Sector Strategies:

- Better Transit Service
- Lower Transit Fares
- More Bicycle Paths
- More Walking Routes
- High Occupancy Vehicle (HOV) Lanes
- Parking Tax
- Reduced Parking Supply
- Land Use Policies Favorable to TDM

Private Sector Strategies

- Commuter Subsidies (for using alternatives to driving alone)
- Carpool Programs
- Vanpool Programs
- Flex-time
- Telecommuting
- Compressed Work Weeks (e.g. 4/40 schedule)
- Parking Charges

Implementation Mechanisms

- Clean Air "No-Drive" Days
- TDM Ordinance (requirements on employers/developers)
- Transportation Management Association

Prioritization of Strategies - The next step in the process was to prioritize these strategies so as to determine community preferences and begin to develop packages of TDM strategies that could be analyzed to determine their impact on reducing trips. A TDM Strategies Rating Form was developed to accomplish this prioritization process. The form asked the following questions for each of the 18 strategies listed above:

Is it applicable to Missoula?
Is it effective?

Will policy-makers support it?
Will people accept and do it?
Can we afford it?

After answering these questions, those completing the form (mostly members of the TTAC) were then asked to rank the strategies from 1-18. The results of that ranking follow:

1. Carpool Programs
2. Parking Controls
3. Better Transit Service
4. Flex-time

5. More Bicycle Paths
6. Parking Charges (employee parking)
7. 4/40 Work Weeks
8. Commuter Subsidies
9. "TDM-Friendly" Land Use Strategies
10. Vanpool Programs
11. More Walking Routes
12. Parking Tax (all spaces)
13. TDM Ordinance
14. Lower Transit Fares
15. Telecommuting
16. Transportation Management Association
17. Clean Air "No Drive" Days
18. High Occupancy Vehicle (HOV) Lanes

At the same time this ranking or prioritization was presented to the TTAC, national evidence as to the cost effectiveness of these strategies was also presented. The strategies were classified as "Most Cost Effective," "Less Cost Effective," "Cost Ineffective," or "Cost Effectiveness Unknown" as follows:

The Most Cost Effective TDM Strategies

- Financial Incentives (e.g., commuter subsidies for not driving alone)
- Financial Disincentives (e.g., parking tax or charges)
- Bicycle and Walking Programs, Facilities and Subsidies
- Parking Management (i.e., reducing the supply of available parking)

Thus, pricing, parking and provision of non-motorized options are among the most cost effective (greatest trip reduction impact at the lowest cost) alternatives. Taxes and/or charges for parking are among the least popular strategies, but most effective and cost-effective because they can immediately change travel behavior and can be revenue neutral or even generate revenue to fund improved travel alternatives.

Less Cost Effective TDM Strategies

- Compressed Work Weeks (e.g., 4/40 schedules)
- Telecommuting
- Carpool and Vanpool Programs

Compressed work weeks and telecommuting are among the most popular strategies with commuters because they offer employees more time at home. However, these strategies can be costly to employers because they involve a change in the basic operating policies of the worksite. Carpool and vanpool programs are also less cost effective because they generally only involve improved information on these travel alternatives (e.g., ridematching computer systems, marketing campaigns), which can be expensive and produce limited impact without supportive incentives or disincentives.

Cost Ineffective TDM Strategies

- TDM Marketing Programs (without incentives)
- Shuttles (for commuters, lunch-time travelers, etc.)
- Transit Service Improvements (without incentives)

Shuttles that connect employment sites to retail areas are often cited as necessary to allow ridesharers to get around midday without their cars. However, most shuttle programs of this type exhibit very low ridership and very high per rider cost. That is not to say all shuttles, such as student/campus shuttles, are ineffective. Likewise, transit service improvements can be very expensive and ineffective if incentives are not in place.

Cost Effectiveness Unknown

- "TDM Friendly" Land Use Policies
- TDM Strategies Applied to Non-Commute Travel

While some early evidence suggests that "transit-oriented," "bicycle-oriented," and "pedestrian-oriented" developments are effective in increasing the use of these modes at new residential, commercial and office sites, the cost effectiveness of these strategies is still somewhat unknown. One study in southern California showed that employers that combined financial incentives with an "aesthetically pleasing" site exhibited trip reduction results 10% higher than those without these two critical strategies.

Finally, the application of TDM strategies to non-commute trips is somewhat problematic. In Missoula, commute (home-base work) trips comprise 16% of all travel, and when coupled with college student trips, comprise 19% of all travel in the region. On the one hand, school, shopping, recreational and other trips generally exhibit higher auto occupancy rates. For example, in Missoula, it is assumed that commute trips have an average occupancy of about 1.1, whereas other types of trips have average occupancies of 1.4 or 1.5. This makes sense when one considers the amount of "natural' carpooling that occurs to schools, to the store, to restaurants, etc. However, many TDM strategies cannot be applied to these other travel markets. For example, one cannot really telecommute to the store (while teleshopping is now available, it still requires someone to drive groceries to your home). Other TDM strategies, such as parking taxes and bicycle improvements can influence all travel markets.

E.2 Overview of TDM Modeling Exercise

Once the range of TDM strategies was defined, discussed and prioritized, an analytical process was initiated to estimate the potential impacts for various packages of TDM strategies applied to the region as a whole and to specific subareas. This was accomplished using the Federal Highway Administration's TDM Evaluation Model.

Description of TDM Model - The FHWA TDM Model is forecasting software designed to estimate the impacts of TDM measures on an incremental basis. For example, it tests the likely increase in carpooling and reduction in vehicle trips and miles of travel (VMT) based on an incremental change in carpooling support, subsidies or parking fees. The baseline is derived from a "snapshot" of current or future travel patterns as derived from the QRS II travel model. The estimates of impacts are based on standard travel forecasting techniques for time and cost measures, and empirical relationships based on national research for other types of TDM program elements.

The TDM Model uses the distribution of employment by organization size and type to evaluate the impact of various mandatory, employer-based programs. **TABLE E-1** shows this distribution.

TABLE E-1
Missoula Employment Distribution

Employees	Office	Non-Office
1-49	34.1%	62.2%
50-99	0.9%	1.4%
100-499	0.7%	0.5%
500+	0.1%	0.1%
Total	35.8%	64.2%

This distribution is significant because the very high proportion of small employers (<50 employees) can adversely affect such programs. Employer-based TDM programs are most effective among larger employers (at least those with more than 50 or 100 employees). This is not to say the larger the employer, the more effective the program, but at the smallest firms the ability to match co-workers into carpools is diminished. Based on national employment data (and the basis for TDM Model default values), only one-third (34%) of employers have less than 50 employees, as compared to almost 95% in Missoula. Missoula also has a higher than average proportion of non-office employers (retail, etc.). This also affects the effectiveness of certain TDM strategies, such as telecommuting, which is generally most appropriate for office-type work.

Model Outputs - The FHWA TDM Model tests various of employer-based (private) and areawide (public) TDM strategies specified by the user to calculate the impact of each package tested on key indicators of program effectiveness. These include:

- starting and resulting mode shares (solo, transit, carpool and vanpool)
- number of person trips (base and modified)
- number of vehicle trips (base and modified)
- number of vehicle miles of travel (base and modified)
- percent person trip reduction
- percent vehicle trip reduction
- percent VMT reduction

The results presented here focus on the last two indicators, the proportional reduction in vehicle trips and VMT. This provides the *relative* impact of each package of TDM strategies and focuses on the variables that affect traffic most - the number of vehicles on the road and the amount they are used. For strategies that are aimed at commute trips, both the commute vehicle trip and VMT reduction percentages are reported, as well as the total trip reductions (factored to account for the 16% of total travel comprised of commuting).

Of the 18 TDM strategies prioritized by the TTAC/TPCC, 14 were evaluated by the TDM Model. The four that could not be evaluated were: flex-time (#4), transportation management associations or TMAs (#16), clean air days/no-drive days (#17), and HOV lanes (#18). Flex-time was not evaluated because a peak hour travel model is needed, but not used in Missoula. The last three strategies were not evaluated because the consensus seemed to dictate they were not appropriate or they were not quantifiable.

One concept that still merits consideration, albeit on a more qualitative basis, is the use of flex-time to address peak period congestion in various locations. Such locations would include the downtown area, key corridors leading downtown (such as the Bitterroot corridor - US 93), and the University of Montana. This strategy simply spreads traffic out over a longer period, but can have a very significant localized affect. Recommendations will also be made on the most effective means to reach small employers and develop cooperative programs among small employers (through merchant associations, building managers, etc.)

Another strategy worth considering is a TMA for the downtown or the University area. These voluntary associations of public and private employers can be instrumental in coordinating TDM strategies in either a voluntary or a regulatory environment. An example of a voluntary TMA effort in the region is the emerging Missoula-Ravalli Transportation Management Association (MR TMA) being formed in the Bitterroot corridor. Originally the focus of MR TMA was exclusively on US 93 between Ravalli County and Missoula. At this time, the focus of MR TMA has broadened to include vehicle trips made throughout the Missoula area and vehicle trip reduction education programs.

E.3 Regional TDM Impacts

In order to assess the overall impact of various TDM strategies applied to the region (City and County of Missoula) as a whole, a regional modeling exercise was undertaken. This regional analysis was designed to determine the relative effectiveness of various TDM strategies in three ways: voluntary participation of employers, mandatory participation by developers, and mandatory participation by all employers. The packages of strategies ranged from voluntary programs with rather innocuous TDM strategies to mandatory programs with more draconian measures.

Land Use and Non-motorized TDM Strategies - Before testing a variety of TDM strategies as applied to the region as a whole, an interim step was needed. There are two very important types of strategies that cannot be analyzed with the TDM Model: 1) land use strategies conducive to TDM and 2) non-motorized strategies (e.g. bicycle and pedestrian improvements). To include these measures, the baseline travel data was modified to include the impacts of these two sets of strategies.

Specifically, one future land use scenario that incorporated some TDM-friendly land use policies, particularly residential and employment densification, was evaluated. Similarly, the potential for increasing bicycle and walk shares based on planned or needed improvements was estimated. This was based on an extensive inventory of existing infrastructure and an assessment of the areas most likely to realize increases in non-motorized travel. In particular, areas that could realize a doubling of the non-motorized share were identified.

Results - Based on these two sets of strategies, a modified set of travel data was produced for the year 2015. When compared to the base set of 2015 trip tables, the implementation of aggressive land use and non-motorized strategies could produce a 6% reduction in total vehicle trips and VMT. This would be accomplished by the following estimated daily reductions:

- person trips (in automobiles): reduced by 6.4% (from 545,905 to 511,020)
- vehicle trips: reduced by 6.4% (from 391,111 to 366,129)
- VMT: reduced by 6.9% (from 1,993,461 to 1,856,379)

Two important considerations should be made when assessing the impact of non-motorized strategies. First, the impacts are somewhat weather dependent. While a number of bicyclists and pedestrian will travel by these means under any conditions, a majority of travelers may not do so during cold or inclement weather. Thus, the 6-7% reduction in vehicle trips cannot be assumed every day of the year. Second, the non-motorized strategies will be most effective in the urban core, close to downtown and the University. The land use strategies, on the other hand, may be most effective in outlying areas experiencing growth. All of the aforementioned factors will affect when and where trip reductions occur.

Employer and Areawide TDM Strategies - A range of employer-based and areawide strategies were tested using the TDM Model. Seven packages of strategies were tested using the base 2015 travel data and another five packages were tested using the modified 2015 travel data to reflect the land use and non-motorized strategies. The programs tested against the base 2015 travel characteristics are as follows:

- **Minimal Voluntary Ridesharing Program:** assuming voluntary participation among employers (a low proportion implementing programs) this program included support of carpools, vanpools and transit, as well as preferential parking for carpools and vanpools.

- **Maximum Voluntary Ridesharing Program:** still assuming low participation among employers, this program included additional support, such as significant alternative work arrangements (compressed work weeks and telecommuting), preferential parking, and direct financial subsidies to carpoolers, vanpoolers, and transit riders ($0.50 per day).

- **Voluntary Alternative Work Arrangement Program:** again assuming voluntary participation among the region's employers, this program involves offering 30% of all employees compressed work weeks and giving another 25% the option of telecommuting (acknowledging that only about 20% of eligible employees will choose to do so).

- **Trip Reduction Ordinance:** the final type of employer-based program would mandate all employers to implement the maximum ridesharing program outlined above.

- **Voluntary Ridesharing plus Transit Service Improvements:** a voluntary program for employers was tested along with areawide improvements to transit service such as: frequency and coverage increases and preferential treatment to speed bus run times (resulting in an average five minute time saving in waiting for a bus and a two minute time savings riding on the bus).

- **Voluntary Ridesharing plus Transit Improvements and a Parking Tax:** a voluntary employer program and transit service improvements were tested with a $1 per day parking tax on all public and private parking spaces (non-residential).

- **Developer-based Ridesharing Requirements:** new developments would be required to implement a moderate ridesharing program (moderate support, preferential parking, alternative work arrangements and subsidies) and site design improvements that are conducive to TDM (such as transit shelters, bicycle storage, etc.)

The voluntary program, developer requirements, and trip reduction ordinance scheme were also tested against the modified 2015 travel data (acknowledging that the modified conditions already include a more than 6% reduction in vehicle trips and VMT from the land use and non-motorized strategies). The land use and non-motorized strategies were also tested with a voluntary rideshare program and areawide strategies that included transit service improvements and a $1 parking tax. **TABLE E-2** summarizes the impacts of each of these programs on: commute vehicle trip reduction, total vehicle trip reduction (all travel), commute VMT reduction, and total VMT reduction.

TABLE E-2
Missoula Regional TDM Program Impacts

Program	Commute Vehicle Trip Reduction	Total Vehicle Trip Reduction	Commute VMT Reduction	Total VMT Reduction
Base 2015 Travel				
Minimal Vol. Ridesharing	0.1%	0.018%	0.1%	0.018%
Max. Vol. Ridesharing	1.0%	0.16%	1.0%	0.16%
Voluntary AWA	0.2%	0.025%	0.2%	0.025%
Developer Requirements	2.2%	0.36%	2.2%	0.36%
Trip Reduction Ordinance	16.8%	2.73%	16.8%	2.72%
Vol. R/S and Transit Improv.	n/a	0.6%	n/a	0.5%
Vol. R/S, Transit, Tax	n/a	18.1%	n/a	17.6%
Modified 2015 Travel (with land use and non-motorized strategies)				
Land Use and Non-motorized	n/a	6.9%	n/a	6.9%
and Vol. Ridesharing	n/a	6.9%	n/a	6.9%
and Developer Requirements	n/a	7.5%	n/a	8.0%

Land Use and Non-motorized	n/a	6.9%	n/a	6.9%
and Trip Reduction Ord.	n/a	9.7%	n/a	10.2%
and Vol. R/S, Transit, Tax	n/a	24.6%	n/a	24.6%

AWA = alternative work arrangements
R/S = ridesharing
n/a = commute travel reductions only reported for employer-based programs

For those programs that solely involved employer-based TDM strategies, both commuter travel and total travel impacts are reported. Total travel impacts account for the fact that commute trips only comprise 16.25% of total trips. For programs that include employer and areawide strategies, only total trips are reported, but these also account for the fact that employer strategies affect only commute trips while areawide strategies impact all travel.

E.4 Subarea TDM Impacts

The intent of the regional analysis was to provide a range of potential TDM strategies and estimate the resulting traffic reduction impacts. Subarea analyses were also performed to estimate the impacts of implementing selected programs within three key subareas: the downtown core, the University of Montana, and the growing Reserve Street corridor. Roughly the same three employer-based programs (voluntary, developer requirements, and trip reduction ordinance) were investigated in combination with transit service improvements and/or parking fees. The subarea analyses can also assist with developing short-run programs, given that the regional program is designed for 2015.

The subarea analysis was performed by "windowing" in on key destination zones and using the base 2015 travel data (given that land use strategies and non-motorized strategies may be longer term and are more regional in nature). Again, commute travel impacts are reported for employer-based programs, but in this case, total impacts are for the subarea, not the region.

Downtown Subarea - in the downtown Missoula core (bounded by the river to the south, Madison to the east, the railroad right-of-way to the north, and Nora to the west), the three employer programs were tested, each with downtown transit service improvements. A voluntary ridesharing program was also tested in combination with transit improvements and a $1 per day parking fee. Finally, $1 per day and $2 per day parking fees were tested, independent of employer-based TDM efforts. As with the regional analysis, the total impacts of employer-based efforts shown in **TABLE E-3** reflect the fact that commute trips make up 16.25% of total trips. Parking pricing was emphasized in the downtown area because of the current existence of on-street and some off-street fees and the relatively greater acceptability of this strategy when compared to less dense areas. Obviously, the Missoula Parking Commission would be heavily involved in any modifications to parking in the downtown area.

TABLE E-3
Downtown Missoula Subarea TDM Impacts

Program	Commute Vehicle Trip Reduction	Total Vehicle Trip Reduction	Commute VMT Reduction	Program VMT Reduction
Vol. R/S and Transit	0.3%	0.04%	0.3%	0.05%
Developer Requirements	2.7%	0.44%	2.6%	0.42%
Trip Reduction Ordinance	18.2%	2.95%	18.1%	2.94%
Vol. R/S and $1 Parking Fee	n/a	18.3%	n/a	17.9%
$1 Parking Fee Increase	n/a	18.1%	n/a	17.9%
$2 Parking Fee Increase	n/a	30.2%	n/a	29.8%

University Subarea - The university subarea analysis is unique in that it largely involves a single, very large employer that can control parking, work hours, commuting behavior, transit service and all the key variables divided between employer and areawide programs in the rest of the region. This results in greater impacts than for most of the programs tested in the other areas. However, the results of employer-based strategies are still adjusted to account for the fact that 19% of all traffic is comprised of commuter trips and college student school trips.

Four programs were tested, including: 1) a minimal ridesharing program and transit service improvements, 2) a ridesharing program that emphasizes compressed work weeks and telecommuting, 3) a program that emphasizes subsidies for those using travel alternatives, and 4) a program involving increased parking fees (a $1 per day increase). In the University subarea analysis, transit service improvements, parking pricing and alternative work arrangements were highlighted. **TABLE E-4** summarizes the impacts of the four programs when applied to the University area (bounded by the Clark Fork River to the north, Mount Sentinel to the east, the golf course to the south, and Higgins to the west.)

TABLE E-4
University of Montana Subarea TDM Impacts

Program	Commute Vehicle Trip Reduction	Total Vehicle Trip Reduction	Commute VMT Reduction	Total VMT Reduction
Minimal R/S and Transit	9.8%	1.87%	9.7%	1.84%
Ridesharing and AWA	11.9%	2.25%	11.8%	2.23%
Ridesharing Subsidies	31.6%	6.0%	31.6%	5.93%
Ridesharing & $1 Parking Fee	n/a	19.2%	n/a	18.7%

Reserve Street Subarea - in order to cover three key areas that are likely to be among principal destinations in the region in the year 2015, the Reserve Street corridor was studied as a growing suburban employment center. The area includes all of Reserve Street from I-90 to Brooks/US 93. All contiguous traffic zones were included, resulting in a corridor roughly one quarter to one half mile wide.

The same strategies analyzed for the downtown were assessed for the Reserve Street corridor, with the exceptions of the two programs that would impose parking fee increases independent of any employer-based ridesharing program. While one combination tested includes a $1 per day parking tax, the limited acceptability of charging for parking at suburban office and retail sites would cause this program to be implausible. However, this strategy is included to illustrate the relative impact of programs with and without financial incentives or disincentives. The impacts of the programs tested are summarized in **TABLE E-5**.

TABLE E-5
Reserve Street Corridor Subarea TDM Impacts

Program	Commute Vehicle Trip Reduction	Total Vehicle Trip Reduction	Commute VMT Reduction	Total VMT Reduction
Vol. R/S and Transit	0.2%	0.03%	0.3%	0.05%
Developer Requirements	6.9%	1.1%	6.9%	1.11%

Program	**Commute Vehicle Trip Reduction**	**Total Vehicle Trip Reduction**	**Commute VMT Reduction**	**Total VMT Reduction**
Trip Reduction Ordinance	20.1%	3.26%	20.1%	3.26%
Vol. R/S and $1 Parking Fee	n/a	18.4%	n/a	18.1%

E.5 Conclusions From Regional and Subarea TDM Modeling

The regional and subarea TDM modeling exercise provided planners and policy-makers in Missoula with a range of TDM programs, strategies and estimated impacts in terms of reducing traffic. The intent of the information was to assist in facilitating a consensus among the TTAC/TPCC on the "preferred" TDM program to be included in the plan update. The following overall conclusions are offered:

Employer-based programs will have limited long-term impacts - alone, these programs do not sufficiently reduce regional traffic volumes (they might be expected to reduce trips by 0.01% to 3%). This is because Missoula is comprised of relatively small employers that are generally less effective in facilitating commute alternatives. The exception to this might be the University of Montana, which would like realize a greater impact from employer-based strategies given their control over key travel variables, notably parking.

Employer programs should be considered as an interim step - even though employer programs are less effective due to the employment composition of Missoula and the fact that only one in six trips in the region would be affected, a voluntary program focused on the downtown (and perhaps the U of M) should be considered. A demonstration program would provide local planners and policy-makers with valuable information on the specific strategies and marketing techniques to encourage commute alternatives. Unlike previous efforts aimed at the general population, the program should target large employers and work through appointed and dedicated coordinators. The program should be launched among federal (US Forest Service) and local government (city and county) employers and might involve the formation of a downtown Transportation Management Association. Flextime among large employers and the University should also be tested.

Transit service improvements would have limited impacts - the transit service improvements (increased coverage and frequency, faster running times, etc.) exhibited very limited trip reduction impacts on a regional basis. However, when applied to the downtown and university subareas where there are heavier concentrations of commuter and student trips, the results were more encouraging.

Land use and non-motorized TDM strategies can be effective - "TDM friendly" land use policies and improvements to bicycle/pedestrian facilities and programs can impact all types of travel. Therefore, the potential impact of these strategies may be greater in the long run than traditional employer-based TDM measures. These measures, considered alone, could reduce vehicle trips and VMT by up to 6-7%, although the impacts may be somewhat weather-dependent.

Area wide pricing strategies are the most effective strategy - while politically among the least popular measures, the fact remains that financial incentives and disincentives, especially areawide parking pricing strategies are the most effective techniques for reducing trips and encouraging travelers to use alternative modes and times of day. A regional parking tax could reduce trips by 18% or more.

A range of regional impacts is possible from TDM - the impacts presented here range from a low of a less than 1% reduction in trips (for a voluntary ridesharing program) to a theoretical maximum trip reduction of 25% (for a combination of all strategies). However, the results possible in Missoula are highly dependent on the community support for changing travel behavior. The maximum impact is based on a combination of programs that has not, to date, been implemented anywhere in the U.S.

E.6 Consensus on Preferred TDM Program

The final steps in incorporating TDM into the Missoula Transportation Plan Update involved the selection of a preferred set of TDM strategies and then the specification of a recommended short and long run TDM program for Missoula.

The choices for the "preferred" TDM program generally involved the following elements -- alone or in combination:

- voluntary employer program
- developer requirements (new employment)
- trip reduction ordinance (all employers)
- transit service improvements
- parking fees or taxes
- TDM-friendly land use policies
- bicycle and pedestrian facility and program improvements

After considerable discussion among the TTAC and TPCC, a consensus was reached on three principle TDM program elements: **a voluntary employer program, an enhanced bicycle and pedestrian program, and modified land use policies to encourage TDM.** Each is discussed in more detail in the next subsection. The overall consensus was that the non-motorized strategies offer the potential for reducing a significant number of trips (up to 6%) in a cost effective manner and that a voluntary employer program is a good short term objective, while the land use policy initiative are needed long term measures.

Several TDM strategies were rejected outright as being infeasible or unacceptable, including: parking fees, HOV lanes, and any type of mandatory requirements on employer and developers. Still other strategies, such as transit service improvements, were not selected as part of the preferred program as they were shown to have a limited impact as a cost effective trip reduction strategy, but were not dismissed altogether.

E.7 Recommended TDM Program

The goal of this Plan is to achieve a 5% reduction in vehicle miles traveled (VMT) within five years and a 10% reduction within ten years. This two stage goal allows the community to benchmark the success of the TDM strategies.

Based on the preferred TDM strategies that were described above, short-, medium-, and long-range TDM programs have been outlined for the Missoula area. The following program description is not intended as a fully-articulated plan for implementing TDM strategies over the next 20 years, rather it is intended as a general framework. As mentioned above, the plan should have at least two distinct time frames, and perhaps three: a short range plan (1-5 years), a medium range plan (5-10 years), and possibly a long range plan (10-20 years).

E.7.1 Short-Range TDM Program: Maximize Volunteerism (1-5 years)

A program, which builds upon the existing work of the ECO Task Force and the "Try a Better Way" campaign, should be developed with the following components:

A. Voluntary employer cooperative program - With the assistance of the City, area employers (including those on the ECO Task Force, e.g., the City, County and University of Montana) and others (e.g., the USFS, Stone Container, etc.) could form a business cooperative to explore the implementation of TDM programs within each organization. This might involve a pilot program, whereby the City would work with several existing and new employer programs to test and evaluate employee acceptance and the effectiveness of various TDM strategies. The impetus for business involvement should not be congestion or air quality; rather TDM should be sold on as a good business practice that benefits participants by solving site access problems, assisting with employee recruitment or retention, and providing additional employee benefits.

The business cooperative could initially start as a Employee Transportation Coordinator (ETC) network that meets regularly and an executive briefing on the program at an annual breakfast/awards meeting. The City and the ECO Task Force could support this effort by:

1. facilitating the ETC network
2. developing and distributing an ETC handbook
3. training new ETCs

4. hosting the annual executives breakfast meetings and awards
5. developing the pilot program and evaluation process
6. providing marketing materials from Mountain Line, Try a Better Way, and the Bicycle/Pedestrian program to ETCs

Estimated Cost: $20,000/year
Possible Funding Source: STPU, City General Fund, G.O. Bond

B. Small employer TDM program - Missoula has a very large proportion of employers with less than 50 employees (96%), and most of these entities have less than ten employees. This clearly affects the ability to group employees into carpools, but does not preclude the use of transit, bicycling, walking, or even alternative work arrangements (e.g., 4/40 schedules and telecommuting). While the small employer market has been a difficult one for the TDM profession to tackle, some techniques, including multi-tenant building campaigns can be effective.

Estimated Cost: $20,000/year
Possible Funding Source: STPU, City General Fund, G.O. Bond

C. Education on "smart" trip-making - Since the employer elements of the program only affect commute trips and some student trips, an aggressive educational campaign on combining or avoiding other types of trips could be implemented. This would be designed to reduce VMT and cold starts by encouraging residents to combine trips (e.g. to drop off school children and shop at the grocery store) or to avoid trips by using the telephone, computer or televisions to access information and services. The information can build upon that provided by the Missoula Air Quality Advisory Council's Personal Solutions information.

Estimated Cost: $10,000/year
Possible Funding Source: STPU, City General Fund, G.O. Bond

D. Flex-time and staggered shifts at largest employment sites - changing the arrival and departure times of commuters and students can be a very effective way to alleviate peak period, localized traffic congestion. While these strategies do not reduce trips or VMT (and therefore, do not have an air quality benefit), similar programs in downtown Hartford, at the El Segundo employment complex in LA, and around major universities, have been highly successful. While many employers in Missoula already have informal flexible schedules, the formalization of flex-time and staggered hours among employers, at places like the University of Montana, the USFS, and the City and County, could go a long ways to reducing congestion around these sites and in heavily congested corridors, such as the Bitterroot/US 93 corridor.

Estimated Cost: $ 5,000/year
Possible Funding Source: STPU, City General Fund, G.O. Bond

E. Episodic air quality program - All of the strategies described above should be incorporated into any future or enhanced episodic air quality program for the winter/spring PM-10 and Carbon monoxide seasons. (See Chapter 13 of this document for more information about these pollutants.) For example, the lessons learned from the business cooperative pilot program should be included in any plans or programs among all participating employers, organizations and campaigns.

Estimated Cost: $ 5,000/year
Possible Funding Source: STPU, City General Fund, G.O. Bond

F. Enhanced bicycle/pedestrian program - Given the greatest TDM impacts are anticipated to derive from the enhanced non-motorized program, implementation of three related program elements should be initiated. First, the bicycle/pedestrian capital improvement program (as enumerated in Section Y) should be implemented on an aggressive schedule. Second, non-motorized information should be updated to reflect these new facilities on an ongoing basis. As the bicycle/pedestrian system is improved and connectivity enhanced, marketing of the program should reflect the ease as which travelers can get around on foot or by pedal. Finally, as part of the employer pilot programs, financial subsidies for non-motorized modes should be encouraged, given national evidence as to their cost effectiveness.

Estimated Cost: $40,000/year
Possible Funding Source: STPU, City General Fund, G.O. Bond

E.7.2 Medium-Range TDM Program: Land Use and Non-Motorized (5-10 years)

The TDM program for the medium-range future -- 5-10 years from now -- should build upon the short-range program and initiate strategies that have a longer-range impact, such as land use policies.

A. Expansion of employer cooperative program into TMA - Based on the experience of the trial period of the business cooperative program, additional employers and organizations should be recruited for involvement in the program. If the ETC network is successful (demonstrating the interest and commitment of the involved organizations), the effort could be expanded into a Transportation Management Association, initially focused on downtown Missoula and the University of Montana. The TMA could relieve the City from the day-to-day responsibilities of operating the program and provide additional focus and resolve to the efforts.

B. Continued implementation of the bicycle/pedestrian program - Those projects programmed for implementation in 5-10 years should be completed and the supporting information and incentive elements continued to assure maximum use and benefits are derived from the capital investment.

C. Land use policies and practices supportive of TDM - The relationship between land use policies and travel behavior cannot be overstated. Modifying existing land use policies and practices, to be more "TDM-friendly" could be very effective as a long-term solution. Supportive land use policies include:

1. **Parking maximums** - reduced parking requirements to encourage the implementation of TDM measures and parking supply management.
2. **Shared parking** - allowing two different and adjacent land uses (e.g., office building and movie theaters) to build and manage shared parking that is less than that required of each site.
3. **Density bonuses** - in certain areas, densification and mixed uses can reduce overall trip generation rates and make shared ride and transit options more effective.
4. **In-filling** - by allowing residential development close to downtown and major employment areas, the ability of residents to bicycle, walk, or use transit to commute is enhanced. Other growth management techniques, as suggested in the new growth management plan, could also be supportive of TDM.
5. **Site design guidelines** - as described below, a number of TDM-friendly site design practices can be incorporated into the development review process, as either a comprehensive policy or on a case-by-case basis for zoning variances.

D. "TDM-friendly" site design features - as mentioned above, site design features that are supportive of TDM programs can be incorporated into site plans and required or negotiated as part of the review process. This is a very common practice throughout the U.S. and has already been used on a limited basis in Montana. Such features should be considered for growing areas, such as the Reserve St. corridor. A illustrative list of some site design features includes:

- provision of bus shelters and information kiosks
- allowance for vanpools in any downtown or University parking structure
- secure and safe bicycle storage at employment, school and retail locations
- showers and lockers for bicyclist and walkers at large employment sites
- pedestrian system connectivity with adjacent sites and other paths

E.7.3 Long-Range TDM Program: Contingency Measures (10-20 years)

The final element of the Missoula TDM program consists of long-range contingency measures that should be considered if the ten-year goal (a 10% reduction in total vehicle trips) is not achieved. In the event that the short- and medium-range TDM programs do not achieve the desired goal, Missoula should revisit the analyses made as part of the 20-year plan and investigate the need to implement more stringent, but less popular TDM measures. These measures may include strategies such as parking pricing and mandatory TDM programs. While not a recommendation of this plan, the possibility of needing more aggressive TDM measures should not be totally ignored.

E.8 Conclusions on TDM

TDM clearly has an important place in the Missoula Urban Area Transportation Plan Update. However. the voluntary employer programs, bicycle/pedestrian improvements, and land use strategies are insufficient to avoid the need for key roadway capacity expansion projects. The highest priority should be the implementation of the non-motorized improvements, but even a 6-7% reduction in vehicle trips during certain times of the year would avoid the need for certain capacity enhancements. TDM is supportive of congestion relief, air quality improvement and regional mobility goals and should be implemented on an incremental basis to test and evaluate the effectiveness and acceptability of the strategies analyzed in this plan. Several short-term TDM program elements have been suggested that are relatively low cost and readily available. Missoula should strive to build more local experience with TDM programs by developing a detailed short-range plan and pilot program and then revisiting that plan in 3-5 years.

Appendix F TDM Programs Proposed by the Missoula-Ravalli Transportation Management Association (MR TMA)

F.1 Introduction

The following represents an outline of Transportation Demand Management (TDM) strategies submitted to the Missoula area Transportation Policy Coordinating Committee (TPCC) by the Missoula Ravalli Transportation Management Association (MR TMA). As used below, TDM encompasses both alternatives to driving alone and the techniques or supporting strategies that encourage the use of these modes. The TDM strategies suggested herein include improvements in alternative modes of transportation; financial or time incentives for the use of these alternative modes; information dissemination and marketing activities to promote these modes, and supporting services that make the use of alternatives more convenient or that remove psychological impediments to their use. Cost estimates for suggested programs are shown in **TABLE F-1**.

Examples of TDM strategies include:

- *Financial/Time incentives*, for example preferential parking for ridesharers, subsidies for transit riders, and transportation allowances.

- *Alternative work arrangements*, flex time and off-peak travel scheduling.

- *Information and marketing*, such as on-site availability of transit schedules, periodic prize drawings for ridesharers, and guaranteed ride home programs.

- *Application of site or area-wide cost surcharges or subsidy measures*, designed to make the relative cost of single occupant vehicle use higher than that for high occupancy vehicles.

F.2 Index of Strategies

Voluntary TDM Strategies

I. Public Mode Support Strategies
    A. Public Education and Promotion
        1. TDM Resource Center
        2. School Outreach Programs
            i. High Schools
            ii. Middle Schools
            iii. Elementary Schools
        3. Promotional Campaigns
        4. Rideshare/Transit Fairs
        5. Community Sponsored Events, i.e. "Try a Better Way" days

- *B. Area-Wide Ridematching Services*
    - *1. Carpooling*
    - *2. Vanpooling*
- *C. Transit Service*
    - *1. Additional Bus Routes*
    - *2. Extended Operating Hours/Expanded Service Frequency*
    - *3. Circulator Bus*
    - *4. Shuttles/Dial-a-Ride*
    - *5. Subscription Bus Service*
        - *i. Lolo*
        - *ii. Hamilton*
    - *6. Worker/Driver Bus Service*
        - *i. Stone Container/St. Patrick Hospital/U.S. Forest Service*
- *D. Vanpool Service*
- *E. Transit and Vanpool Fares*
- *F. Non-motorized Modes*
- *G. Park and Ride Lots*

II. Employer Based TDM Measures

- *A. Monetary Incentives*
- *B. Alternative Work Schedules*
    - *1. Compressed Work Weeks*
    - *2. Flex Time*
    - *3. Off-Peak Starting and Ending Work Times*
- *C. Commute Support Programs*
- *D. Guaranteed Ride Home*
- *E. Parking Management*
- *F. Facilities Amenities*
- *G. Transportation Management Associations*

III. Telecommunications Strategies

- *A. Telecommuting/Home Offices*
- *B. Advanced Telecommunications*

Land Use/Zoning Related TDM Strategies

IV. Land Use Strategies

- *A. Development Impact Mitigation*
- *B. Mixed Land Use/Jobs/Housing Balance*
- *C. Transit-Oriented and Pedestrian Friendly Design*
- *D. Residential Density Increases*
- *E. Employment Center Density Increases*
- *F. Parking Management*
- *G. On-Site Amenities*

Mandatory TDM Strategies

- *V. Tax/Pricing Related Strategies*
  - *A. Gasoline Tax Increases*
  - *B. VMT Tax*
  - *C. Congestion Pricing*
  - *D. Parking Tax*

Institutional and Regulatory TDM Strategies

- *VI. Policy and Regulatory Strategies*
  - *A. Trip Reduction Ordinance*
    - *1. State Legislation*
    - *2. County Ordinance*

F.3 Voluntary TDM Strategies

- *I. Public Mode Support Strategies*
  - *A. Public Education and Promotion*
    - *1. TDM Resource Center*
    - *2. School Outreach Programs*
      - *i. High Schools*
      - *ii. Middle Schools*
      - *iii. Elementary Schools*
    - *3. Promotional Campaigns*
    - *4. Rideshare/Transit Fairs*
    - *5. Community Sponsored Events, i.e. "Try a Better Way" days*

Description: Public education is the one TDM strategy that complements every other strategy, in that it helps to create a climate that fosters public acceptance and the use of alternative modes. Public education can be general or specific, focusing on topics ranging from the relationship among SOV usage, clean air, and congestion, to the announcement of a new bus route. Promotional campaigns can be broadly focused through the use of mass media such as radio, billboards, or newspaper; or narrowly targeted through the use of brochures and flyers that can be mailed to specific user markets or distributed through employment sites. Additionally, public education can be accomplished through activities such as rideshare and transit fairs, or community sponsored events such as "Try a Better Way" day.

Too often, "marketing" is overlooked as a necessary component of a TDM project. It is, however, a vital element. For many SOV travelers, knowledge of HOV options is low. Others who may know the options may not consider the idea of abandoning their comfortable mode because of perceptions (or misperceptions) about HOV modes. Public education is a way to inform and create favorable perceptions of HOV modes.

An important element of the public education strategy would be the school outreach component. Specially designed curriculum, already being developed and implemented by MR TMA, would be expanded to all students throughout the Missoula area, K - 12. The school outreach activity would consist of a systematic learning experience to educate future drivers about their mobility choices.

Market/Geographical Setting: Public education is appropriate in any type of market or geographical setting. The style and scale of the outreach campaign must be tailored to the Missoula area.

Time Frame: Short to long. The time needed to analyze the market, prepare materials, and begin distribution can be less than six months. A marketing campaign can have a fixed length or can be indefinite in length, with materials for one campaign stored and used as needed for future events. Annual events can be planned to continually reinforce a message. Given the public's low level of interest in changing travel behavior, it appears that continuing promotion and education is needed over the long term.

Cost: The projected cost for the first year is $120,000. This projected amount includes all five components described above. With the exception of a multi-media advertising campaign, public education on TDM can be provided for minimal costs. Creating the TDM Resource Center to coordinate the various activities, including supervising the school outreach classes would be needed to coordinate production and distribution, and event scheduling. Because of the public nature of the promoted modes, free media attention can often be obtained.

Companion Strategies: As noted above, public education is a companion strategy for every other TDM strategy.

Effectiveness: Although exact estimates may vary, it is projected that comprehensive, ongoing TDM public education and promotion can result in a *trip reduction* of up to 3%. However, while public education itself may not be highly effective in reducing VMT, at least in the short term, ongoing efforts are essential to bring about a high level of awareness such as that achieved for litter control and recycling. It is very difficult to change travel behavior. Including a public education/promotion element in every other TDM strategy can be expected to increase the effectiveness of those strategies.

Implementation Difficulties: There should be no major obstacles to implementing public education strategies. In fact, because of the "good citizen" nature of this message, it should be possible to obtain corporate sponsors/ donated work, thus reducing costs and increasing the ease of implementation. Public education campaigns that rely on others, such as local employers, to deliver promotional materials may face the difficulty of coordinating different players with other priorities.

B. Area-Wide Ridematching Services

1. Carpooling
2. Vanpooling

Description: Ridesharing includes car pooling and van pooling. A car pool is any passenger vehicle with a minimum of two people who commute together on a regular basis. A van pool is a passenger van used by seven to fifteen commuters. Cars are usually privately owned, and vans may be privately owned or owned by a public agency, an employer, or a third party. While much ride sharing takes place through informal arrangements between family members and co-workers, ride sharing placement agencies are also widely used. At present, MR TMA is the only formal agency conducting ridematching services in the Missoula and Ravalli county areas. MR TMA is currently developing a database of interested commuters based upon their travel plans.

Along with simply maintaining the database, efforts must be made to generate the database. Marketing to the general public and to large employment sites must occur to continually acquire names and to update records.

Technical advances have led to demonstrations of dynamic (real time) ride matching and the utilization of the ridematch concept for non-commute travel.

Market/Geographical Setting: Ridematching is applicable to both the Missoula urban or suburban area. Employment not well served by Mountain Line's fixed routes can benefit from a ride matching program. In areas where trips start and end in the outer Missoula suburban districts, ride sharing may be the primary "public transit" option. Dynamic ride matching is a strategy that has the potential to be extended to the UM student population and, perhaps, to general travel.

Time Frame: Short to medium. To set up a traditional ride match system, acquiring hardware and software for an existing agency can be reasonably accomplished in 3-6 months. Acquiring a "critical mass" of commuters in the database is necessary before successful matches are likely to be produced. Advanced ride match systems, including dynamic matching, GIS "Geomapping", Internet access and FAX/modem connections have been developed and are available now.

Cost: This project could be implemented for as little as $20,000 initially, and maintained for $10,000 per year. Some of the project costs would be included in the public education and promotion activities described above. Hardware and software costs depend upon the size of the system envisioned. A minimal automated system would include a PC and a database program. Additional costs include staff and marketing. Costs to businesses would occur to the extent that they develop supporting programs and acquire needed hardware, software, and network access to advanced systems. These may be offset by improved employee morale due to less stressful commutes (or they may be necessitated a CTR law).

Companion Strategies: Many area-wide and employer based strategies can increase the effectiveness of a regional ride match program by providing incentives to travelers to rideshare. Some examples: 1) Preferential parking for HOVs provides a convenience incentive; 2) Flex-time facilitates car pooling by allowing flexibility in start and leave times; 3) Circulator shuttles and mixed-use development allow carpoolers access to services during lunch hour; and 4) Guaranteed ride home programs cover the need for emergency transportation home in case an HOV option is not available.

Effectiveness: The effectiveness of an area-wide ride sharing program will vary greatly, depending upon the companion strategies involved. Studies have estimated that such services can achieve a 0.1 to 2.0 percent reduction in region-wide VMT, though a JHK literature review found a range of reductions in annual VMT of 0.3 to 3.6 percent in 38 areas, as reported by USDOT. These studies show that many commuters are willing to consider alternatives to SOV travel if their concerns are overcome. These concerns are often linked to security, flexibility and convenience. Very little research has been completed on the effectiveness of dynamic ride matching or of ride matching for non-commute trips.

Implementation Difficulties: There are generally few difficulties to starting a ride matching program. Implementing supportive strategies may be more difficult. Some employers may not want their employees riding with a competitor's employees, however many matching programs can accommodate these concerns and ensure privacy. Selling the program to the public and obtaining a sufficiently large database may be difficult.

C. Transit Service
- *1. Additional Bus Routes*
- *2. Extended Operating Hours/Expanded Service Frequency*
- *3. Circulator Bus*
- *4. Shuttles/Dial-a-Ride*
- *5. Subscription Bus Service*
    - *i. Lolo*
    - *ii. Hamilton*
- *6. Worker/Driver Bus Service*
    - *i. Stone Container/St. Patrick Hospital/U.S. Forest Service*

Description: (Note: Transit options outlined in this chapter are in addition to, and in conjunction with that material contained in Chapter 5, Transit System Analysis.) Since the ultimate goal is to reduce trips by SOVs, alternative methods of travel must be provided. With conventional transit there is a "chicken and egg" effect. People may not use transit options because the options are insufficient. And, when there is not enough demand, less transit service is provided. Increasing service can serve both to encourage new users and to accommodate the new users enticed through this and other TDM measures.

Increases in transit services can cover a wide range of options, including:

Additional Bus Routes. Routes that serve new activity centers, or that better serve existing activity centers, such as express routes, can allow bus service to better compete with SOVs. In theory, it is quite easy to develop expanded service in a specific corridor.

Extended Operating Hours or Expanded Service Frequency. More frequent service by buses allows this mode to better compete with the flexibility of SOV travel.

Shuttles, Circulators and Dial-a-Ride. Smaller vehicles (usually), perhaps with more flexible scheduling than that of buses, can provide services around activity centers, transportation hubs, or in a corridor, as well as providing greater "reach" at both ends of an express service. Use of the "circulator trolley", already planned for implementation in Missoula in fall, 1996, is an example of *specific* transit enhancements that can improve both traffic and parking congestion in the downtown Missoula area.

Custom or Subscription Bus Service. Custom service can be designed around a fairly large group that needs to make a single, usually rather long, trip each work day. Such custom service may require premium fares. Examples of subscription bus service would include express service along the Bitterroot corridor between Hamilton and Missoula, with stops at Victor, Stevensville, Florence and Lolo to pick up and drop off commuters from those communities. Using a self-funded subscription fare, in conjunction with establishing "park and ride" sites along the route, would allow implementation at little or no expense of public funds.

Worker/Driver Bus Service. This service is somewhat like a custom bus route; however, the driver actually works full time at the destination of the route, where the bus stays during the work day. He/she is also employed part time by the transit agency and takes the bus home at night (or to a nearby public parking facility). An example of this system is the worker bus previously utilized by employees at Stone Container Corp.

Market/Geographical Setting: Conventional transit service usually works best in the more densely populated Missoula urban areas, especially when the density exists at the destination. Non-conventional services, such as shuttles and circulators, can be more flexible and tailored to serve either urban or suburban activity centers.

Time Frame: Short to medium. In Missoula, enhancing transit service can be accomplished through the purchase or leasing of vehicles and the hiring of staff (assuming funds are available to cover operating and capital expenditures). Generally, the more flexible services can be implemented more quickly. Additional market research is necessary to decide where or when to best implement the new or additional services. An advantage is that service can be implemented incrementally or in phases, as demand warrants.

Cost: Moderate to high. Implementing any of the above options could exceed $200,000 per year (*in addition to* the existing Mountain Line operating expenses). Additional staff, administrative, and capital costs, especially for conventional transit, are costly. Fares typically cover less than 25% of operating costs and virtually no portion of capital costs, thus necessitating large public subsidies. The costs of making marginal changes to an existing system vary widely with the type of change. Custom services often are designed to operate with lower subsidy levels.

Companion Strategies: To the extent that increased use of transit services is the desired result of many TDM strategies, any or all of these other strategies are companions. Where increased transit service itself is a TDM strategy, it is important that it be accompanied by marketing. As traditional fixed-route transit works best in areas of high density land use, strategies that move the urban design toward these high density patterns can help increase the effectiveness of transit. Financial incentives, such as employer subsidies, increase the effectiveness of this measure, as do auto disincentives, such as parking fees and SOV access restrictions.

Effectiveness: The effectiveness of providing increased transit services varies greatly, depending upon the extent to which this service reflects the needs of the population it is designed to serve. Depending upon the type, amount, and cost of increased service, up to a 5% reduction in area-wide VMT can be expected. The average response to frequency improvements for bus service is roughly a 0.4%-0.5% ridership gain per 1% frequency increase. The closer transit can come to matching the flexibility, speed, convenience, and marginal cost per trip (to the user) of the private auto, the more effective it will be.

Implementation Difficulties: Transit services and transit agencies typically use most, if not all, of the public funds available to them for their operations. Therefore, expanding service raises issues of either reallocating resources from one area to another or obtaining additional funds, which may be politically difficult if new revenue sources are required.

D. Vanpool Service

Description: Vanpools are groups of commuters (usually numbering 7 to 15) commuting together in a publicly provided or privately owned van. When the van is publicly provided, van pool participants pay a fee, which collectively covers the cost of purchasing and operating the van. The driver is a fellow commuter who, as a form of compensation for driving services, may receive a reduced fare and/or private use of the van for non-commuting purposes. The driver is also often responsible for maintaining the books on the van and scheduling maintenance.

Employers frequently sponsor van pools for their employees, either by providing a van or by subsidizing fares for a van from a public provider. Along with providing vans, public ride sharing agencies can facilitate van pool formation by providing the names of potential riders, or by running subsidized promotions of van pools (one free "trial" month). Additionally, it is important to note that under existing Internal Revenue Service Commute Fringe Benefit regulations, subsidies of up to $65 per month are not taxable for the employees.

Market/Geographical Setting: Van pools traditionally work best with commuters and students who maintain regular commuting schedules and who have longer than normal commutes. Van pools are relied on to serve suburban employment sites that are not well served by conventional transit. Recently van pools have been introduced in some areas of the country, with some success, to short distance commutes.

Two markets in the Missoula area lend themselves to van pools: Faculty, staff and students commuting to the University of Montana, and employees commuting to major employment sites such as St. Patrick Hospital; U.S. Forest Service; Stone Container; School District One; Missoula Downtown area.

Time Frame: Short to medium. Implementing an area-wide van pool program requires an agency to not only acquire the vans, but also to set up an institutional mechanism for allotting and filling the vans, a matching system, and maintenance procedures. Additionally, legal questions of liability are important and must be addressed before operation can begin. Once the program is in place, marketing must occur to encourage use of the service, but significant expansion can take place within a short period.

Cost: Medium. An initial vanpool program, with capital equipment, staff and administrative costs, could be implemented for $150,000. Van pool fares are often set to cover the costs of purchasing, maintaining, and operating the vehicles. Employers often subsidize the commuting costs of their employees in van pools.

Companion Strategies: A guaranteed ride home program, in which an employee who is unable to commute home by the scheduled van pool can take a taxi at a reduced fare, can help to encourage employees to use a van pool because they know that their emergency situations are covered. Subsidized fares, whether by employers or public agencies, can significantly increase van pool utilization.

Effectiveness: Vanpool programs can produce a commute trip VMT reduction of up to 8%. For example, in King County, Washington, slightly under 1% of commuters now commute by van pool. The public rideshare/transit agencies in Washington state currently operate approximately 900 van pools, of which 550 are operated by King County (Metro). Obviously, a single van pool can take up to 14 SOVs off the road, so the effectiveness of van pooling as a TDM strategy depends to a large degree on the number of people participating.

Implementation Difficulties: Given the relative lack of public van pool programs in Montana, all of the known legal issues have yet to be addressed. Finding riders for van pools, and occasionally drivers, may be an obstacle.

E. Transit and Vanpool Fares

Description: Like most everything else, transit and van pool ridership is sensitive to changes in fares, and a lower fare results in increased ridership. The price elasticity of demand for transit is commonly estimated to be -0.3, meaning that a 50% reduction in transit fares will result in a 15% increase in transit ridership. There is no consensus on the price elasticity of van pool fares, which are generally set to fully recover costs.

It is possible to target different groups through the use of a multi-tiered fare structure. Common examples, such as reduced transit fares for senior citizens and children, may well have been implemented as a courtesy, out of a recognition of ability to pay, or out of political considerations, but they can also be viewed as affecting the mode choice of these groups, encouraging bus travel over driving alone or having parents drive. Likewise, a transit system with a free ride zone downtown encourages people to use the bus instead of an SOV while they are in the zone, and it can help reduce congestion inside the zone. Van pool fares could be reduced for trips through a certain corridor or to a specific destination to increase van pool ridership.

Along with these strategies, transit passes can be used to encourage bus and van pool use, both by providing riders a lower than fare box cost and by providing an easy and convenient method of paying. Most van pool programs accept transit passes towards van pool fares, thereby allowing vanpoolers use of employer-provided pass subsidies. Having a pass also allows vanpoolers to ride transit, for example, as backup to the van pool.

Van pool fares have traditionally covered 100% of both the operating and capital costs. Van pool services are sometimes regarded as competing with fixed-route transit. This can result in inconsistent public subsidies for urban fixed-route transit and suburban van pool markets. Recently, this inequity seems to have received increased review and analysis, and a few areas in the country are now beginning to subsidize van pool fares. It is likely that this trend will increase because van pools are increasingly being recognized as virtually the only real option (along with car pools) for a major share of trips.

Market/Geographical Setting: In any market where transit and van pools can or do operate, fare structuring may be used to encourage greater use by specific groups of commuters.

Time Frame: Short to medium. Extensive market analysis should be done before any fare change is implemented to ensure that the new structure will accomplish the intended goals and that either sufficient service capacity exists or can be added. If new features are added to a fare system, such as a free ride zone, or new types of bus passes, institutional arrangements will need to be made, and personnel trained before implementation.

Cost: Medium to high. Any decrease in fares, unless completely offset by sufficient ridership increases, will decrease fare box revenues and increase the need for, and level of, public subsidies.

Companion Strategies: Fares are not the only factor people consider when deciding whether to take the bus or a van pool. Therefore, for transit service, improving the availability, quality and/or frequency can also be goals. Improved safety, comfort, service, and convenience all encourage transit use. Additionally, public education is needed to alert potential riders of these options. Finally, any strategy that makes SOV travel more difficult increases the use of transit and van pools.

Effectiveness: While the price elasticity of demand stated above (-0.3 for transit and -0.1 for van pools) gives some indication of the level of effectiveness to be expected, this fluctuates depending upon the additional TDM measures implemented and the level and quality of the services available. Demonstrations of low or free transit fares in urban areas (Denver, Boston) have estimated area-wide VMT reductions of approximately 2%. The Puget Sound Regional Council estimates the potential vehicle trip reduction for transit service fare changes at 1.8%.

Implementation Difficulties: If additional public money is needed to reduce transit and/or van pool fares, then this approach may become a political issue and these services will be forced to compete for scarce public dollars (including roadway capacity expansion projects). Nationally, transit use has decreased over the past two decades, and public subsidies per ride have increased, so there may be reluctance to provide additional funding. Furthermore, to the degree that increased transit and van pooling replace traditional roadway expansion projects, availability of the new subsidy funds must be ensured for the life of the project that was displaced by the increased HOV services.

Current Applications: Many transit agencies use zone-based fares, peak period fares, bus passes, ride-free zones, and special fares for different user groups. Except in limited cases, van pool fares are virtually all set at full cost recovery (operating and capital), although agencies have different ways of calculating those costs and allocating them to their fares.

F. Non-motorized Modes

Description: (Note: The material contained in this section is intended to supplement the information contained in Chapters 3 and 4 of the Transportation Plan). There are many ways in which the use of either bicycling or walking can be encouraged. Some of these, such as the provision of bicycle racks, lockers, or changing/shower facilities, must be implemented at the work site. The provision of adequate infrastructure, including sidewalks and walkways in suburban employment areas and business districts, is a requirement to increasing these modes. Other facilitating programs can be implemented at the home end, either by requiring pedestrian/bicycle friendly design in the construction of new residential developments or by retroactively creating bike/pedestrian access routes through cul-de-sacs. Both of these may be accomplished with or without local regulatory action. Other actions, such as creating or striping bicycle paths or lanes, are strictly the responsibility of the public sector.

Other public sector actions could encourage the use of non-motorized transportation as part of a multi-modal trip. Such actions would include the provision of bicycle carriers on buses (already in effect with Mountain Line buses), bicycle racks, lockers, and changing/shower facilities at Park & Ride lots.

The provision of bicycles during the day for short employee trips (a "non-motorpool") can encourage the use of transit or other ride sharing, as it provides a way for employees to make short, lunch hour personal trips for which they might otherwise need a car.

Market/Geographical Setting: Efforts to encourage bicycle or pedestrian commuting are most successful where the distance between home and work is short (3 miles or less). Factors such as topography, weather, and safety have a large influence on the number of commuters who consider using these modes. Pedestrian amenities are important in all activity centers.

Time Frame: Short to long. Employer based actions can be implemented most quickly, especially the simple provision of bike racks. Shower/changing facilities may already exist, may be easily converted, or may require more expensive and time consuming construction. Residential actions take longer to implement, as they become incorporated into the development process. Striping bicycle lanes would require policy direction from the Missoula City Council and engineering studies from the roads department. Constructing new bike or pedestrian paths requires right-of-way acquisition, planning studies, construction... potentially a long process.

Cost: $20,000 per year would be a conservative estimate. This amount would be *in addition to* that allocated to the Missoula Bike/Ped office. Obtaining bikes for a "non-motorpool" can be done for less than $100 each. Provision of a bike rack or locker may cost $1,000. Path construction, which requires land purchase, can be expensive.

Companion Strategies: Marketing, especially that emphasizes the health benefits of bicycling and walking, may help increase the use of these modes. Incentives to use non-SOV modes and restricted SOV access also increase the use of these alternatives.

Effectiveness: Only about 3% of the population ever uses non-motorized transportation to commute, and that probably varies by season. Several studies have suggested that up to 1% of commute trips under 6 miles could be converted to bicycle trips.

Implementation Difficulties: Low cost actions may encounter few implementation difficulties. However, as the price increases, employers and local government may be reluctant to spend money for a potentially low return in terms of SOV mode reduction. Those projects that can combine a commute benefit with a recreation and/or safety aspect may have a better chance at success.

G. Park and Ride Lots

Description: Park & Ride lots assist in car pool or van pool formation and serve as transit hubs. Park & Ride lots can be built specifically for that purpose, or they can be leased from owners of surplus parking space. Park & Ride lots can also include bicycle and pedestrian facilities to accommodate multi-modal trips and increase the reach of these non-vehicular modes.

Market/Geographical Setting: Park & Ride lots can be especially important in suburban settings where the lack of residential density makes car pool formation and transit use difficult. Providing Park & Ride lots creates small points of density from which individuals can switch from SOVs to HOVs.

Two sites in the downtown Missoula area appear especially amenable for Park & Ride sites, to relieve congestion and parking pressure in the immediate downtown area: at the north end of Higgins Avenue, and portions of McCormick Park. In each instance, the circulator trolley could service the satellite parking areas at nominal cost.

Time Frame: Short to medium. Often sites that experience peak use outside of the commute day, such as churches, movie theaters, or County fairgrounds, are ideal locations for Park & Ride use and can be utilized almost immediately.

Cost: If new sites are acquired, the annual expense could average $50,000. If existing sites are utilized, the annual expense could be reduced to $5,000 - $10,000 for signing and maintenance.

Companion Strategies: As Park & Ride lots serve as staging locations for car pools, van pools, and transit use, strategies that encourage the use of these modes increase the effectiveness of Park & Ride development. These include transit subsides, ride matching assistance, and pricing strategies that serve as disincentives to SOV use.

Effectiveness: By themselves, Park & Ride lots are estimated to cause a less than 0.5% reduction in region-wide VMT. Part of this is due to the small number of spaces compared to the large number of daily vehicle trips. Presumably, the VMT for the individuals who use the Park & Ride lots is cut considerably, probably by at least 50%.

Implementation Difficulties: There may be zoning problems (e.g., restrictions on secondary uses of a church's parking) and, especially for larger, sole purpose lots, difficulty in finding an adequately large site and/or community opposition to increased traffic.

II. Employer Based TDM Measures

A. Monetary Incentives

Description: Money is a great motivator, and many employers have found it simple and effective to encourage the use of HOVs by providing their employees with a monetary incentive to do so. These subsidies can help "even the playing field" with the private auto, which is subsidized at both the employer end, through free parking, and at the public end, as a result of users not being charged the true cost of auto use (pollution, congestion, and road construction and maintenance). As noted above, under current IRS rules an employer can provide parking with a market value of up to $165 per month, tax free to the employee. Employers can only provide a transit/vanpool subsidy of up to $65 per month tax free. Any financial incentives given by an employer to commuters who car pool, bicycle, or walk, however, are taxed in full. Monetary incentives could take the following forms:

> Direct Subsidies. Employers provide a direct payment such as a reduced price for the monthly transit system pass, subsidized use of employer vehicles for ride sharing, or free parking for HOVs (if there is otherwise a parking charge).
>
> Transportation Allowances/Parking "cash out". Employers institute a charge for parking at the site and offer cash in lieu of parking to all employees. Employees are free to use this money to pay for parking, as a subsidy toward a transit pass, or as additional income. HOV users are automatically subsidized in this way because the allowance is per person, whereas the parking charge is per vehicle, although HOVs can also be allowed to park for free.
>
> Indirect Financial Incentives. Cash or non-cash rewards, such as discounts at nearby commercial establishments or vacation time, can be used as a marketing tool to encourage HOV use. Under such a scheme, employees earn points for ride sharing, which are redeemable in certain quantities for rewards.

Market/Geographical Setting: Employers throughout the Missoula area can effectively use monetary incentives.

Time Frame: Short. Some types of financial incentives can be implemented immediately upon a decision to do so. Others, such as a parking cash out, may require more study to determine the proper level of the parking charge/transportation allowance.

Cost: Low to Moderate. Federal tax code limits the tax free amount of a transit/vanpool subsidy to $65 per month. "Transportation allowances," while not tax free to the employee, would not need to be higher than this. Combined with a parking charge, they may break even or generate revenue for the employer.

Companion Strategies: Provision of alternative transportation options is an important companion strategy. Therefore, reliable bus service or a shuttle linking the employment site to a nearby Park & Ride lot can make a transit subsidy more effective. Ride matching assistance and/or provision of bike or pedestrian facilities can help employees take advantage of the transportation allowance.

Effectiveness: COMSIS has estimated that a reduction in trips of between 8% and 18% can be expected at individual employment sites, although this is heavily dependent upon the availability of services to the sites that are alternatives to SOV commuting. Parking cash out programs are estimated to potentially affect 15% to 20% of total employee trips.

Implementation Difficulties: Minimal. The initial focus in Missoula would be on educating employers about the relative costs and advantages to providing financial incentives.

B. Alternative Work Schedules
  1. *Compressed Work Weeks*
  2. *Flex Time*
  3. *Off-Peak Starting and Ending Work Times*

Description: Employers can institute a wide variety of alternative work schedules, which can disperse and reduce commute trips and/or make it easier for employees to take advantage of HOV commuting opportunities.

Compressed Work Schedules allow an employee to stay home from work on one day each week or one day every two weeks. Examples of this include the 4/40 schedule (four ten-hour days per week) or the 9/80 schedule (nine nine-hour days in two weeks, with the 10th day off). Most who work a compressed schedule take either Fridays or Mondays off.

Flexible Work Hours or "Flex-time" is a strategy whereby an employer allows employees to set their own starting and ending times, usually within certain limits. This approach makes it easier for an employee to take an otherwise inconvenient bus route or car pool with a neighbor whose work hours may be less flexible. Flex-time also permits employees to come in earlier or later than normal to avoid the peak commute hours, or to accommodate non-work activities.

Off-Peak Starting and Ending Work Times is a strategy whereby an employer adjusts the starting and ending work times other than 7 a.m., 8 a.m. or 9 a.m. Both the city and county of Missoula, and the University of Montana could shift to starting work days or classes at 7:30 or 8:30 a.m., thereby reducing traffic congestion throughout the downtown and University areas.

Market/Geographical Setting: Alternative work hours can be implemented in both public and private sector sites. Certain types of work sites, however, are not as amenable to alternative work hours. These include manufacturing and assembly operations, as well as businesses whose employees must all be on site at the same time to work with customers or other employees. Most companies, however, can implement some types of flexible or alternative schedules.

Time Frame: Short. A flextime strategy can generally be implemented immediately. A compressed work week may require consultation or negotiations among employees, unions, and management before implementation.

Cost: Low. There are few costs associated with this strategy. In fact, cost savings may be involved, since production efficiencies may result from a compressed work week, along with improved morale. If a company is able to operate solely on a four-day week, significant overhead savings may result.

Companion Strategies: Ridesharing assistance and transit pass subsidies can help employees take advantage of flextime.

Effectiveness: Alternative work schedules are estimated to achieve up to a 1% reduction in region-wide VMT and vehicle trip reduction.

Implementation Difficulties: The major impediment to implementing some sort of alternative work schedule is probably tradition. Either the employees or management may be reluctant to move away from traditional schedules.

C. Commute Support Programs

Description: Since employment sites are the destination or origin of many trips taken during peak commute periods, many activities and programs could be implemented by Missoula area employers. Commute support programs include the following:

> An Employee Transportation Coordinator (ETC) is the person within the company whom employees can go to for assistance with arranging alternative commute modes. ETCs may do this job exclusively or as just one facet of their workplace responsibilities. ETCs may coordinate many of the programs listed below or may be a liaison to a local transit agency for actual implementation. Additionally, ETCs can represent transportation related concerns to upper management.
>
> Marketing and Promotion. Posters, flyers, rideshare fares, competitions, and other types of promotional activities can all serve to increase awareness of SOV alternatives. Ride matching can be accomplished either internally or by providing access to a regional system. Fleet Ride Programs are an option for employers with a motor pool. Company cars are made

available to car pooling employees for commute purposes. Participating employees typically pay for the cost per vehicle mile.

Employer Vanpool Programs, like ride matching, can be initiated internally or coordinated with an outside agency. In either case the goal is to encourage seven to 15 employees to commute together in a van.

In some states (i.e. Washington and Oregon) general commute support programs are required for employers of 100 or more employees in the state's most urbanized counties. They are often supplemented by other, specific demand management measures. These are just examples; many types of creative programs can be implemented by employers to encourage HOV and non motorized usage.

Market/Geographical Setting: Any employer can implement some combination of TDM support programs, but the target market is generally urban and congested areas.

Time Frame: Short to medium. Many TDM support programs can be implemented immediately upon a decision to do so. Others may require background work and/or can be implemented incrementally.

Cost: $5,000 per year could be spent to assist employers in sponsoring commute support programs. Along with the inherently low cost of general commute support programs, many of these services can be supported by local transit or rideshare agencies, with the employer serving only as a facilitating intermediary. A full-time ETC is generally not required: Washington State CTR guidelines suggest that one full-time ETC is needed to serve about 4000 employees. Fleet ride and van pool programs can increase the program costs.

Companion Strategies: At the employer level, strategies that discourage SOV usage, such as parking charges, increase usage of these TDM support programs. At the local or regional level, strategies that improve HOV comfort and convenience complement employer programs.

Effectiveness: Implemented individually, each of these programs has a very limited impact. However, when implemented as part of a comprehensive program, and especially in conjunction with regional efforts, they can definitely influence employee travel behavior. COMSIS studies have found that general commute support programs without financial incentives average a 1.7% decrease in SOV commute trips to individual employment sites. The decrease averages 6.4% with financial incentives. The Puget Sound Regional Council concluded that general employer ride sharing programs will lead to a reduction of 0.1% - 2.0% in region-wide VMT.

Implementation Difficulties: There should be no difficulty in implementing at least minimal TDM support programs.

D. Guaranteed Ride Home

Description: Guaranteed Ride Home (GRH) is a strategy generally offered to complement other TDM strategies. Many commuters are reluctant to use non-SOV commute methods if they have a potential need to access a vehicle during the work day. Situations that might require an employee's use of GRH include personal or family emergencies and unscheduled overtime. Lacking a Guaranteed Ride Home program, many parents of school-age children drive their own vehicle to work so that, in the event of an emergency, they are able to leave work to pick up their child at school or day care. Although this occurrence may be very unlikely, the potential exists, and parents view the need to be available for their children in an emergency as more important than the economic and social benefits of transit or rideshare commuting.

By offering a guaranteed ride home to employees, employers can increase the utilization of their Commute Trip Reduction program and change commuting behavior. Car pooling, van pooling, and transit are much more attractive to workers when, in the event of an emergency, they have a convenient and affordable means to get home.

Guaranteed Rides Home can take several different forms: a taxi subscription service, contracting with transit or van pool operators to provide emergency services on-call, or designating company vehicle(s) for GRH use.

Market/Geographic Setting: This program would be especially useful to commuters driving from the Bitterroot Valley, and areas north of Missoula such as Arlee.

Time Frame: Guaranteed Ride Home services can be quickly implemented. Their effect on the use of transportation options, however, may take some time to appear. It is important to publicize implementation of GRH service so employees are aware of its availability. Publicity should tie GRH availability to its natural enhancement of non-SOV modes.

Cost: Low, estimated to be less than $2,000 annually. Although GRH guarantees a ride to all employees using non-SOV modes -- and therefore may seem potentially expensive to employers--in practice in other states it is rarely used. Additionally, while some agencies provide GRH gratis, others recoup some or all of their program costs through a nominal charge for GRH usage. Others pool their efforts through their Transportation Management Associations (TMA) or through an agreement with other employers in their geographic area. It is the guarantee that is important; providing assurance to employees that their mode choice will not jeopardize their ability to respond to non-work concerns such as family emergencies.

A Guaranteed Ride Home pilot project conducted from March 1992 through March, 1993 in the Baltimore, Md., area found that about 25% of eligible employees (those using non-SOV commute modes) signed up for a GRH that required no out of pocket expenses for the user and covered up to six personal emergency uses and four uses due to unscheduled overtime. During the one-year demonstration the program participants utilized less than four percent of the program's maximum allowable trips. King County (Metro) analyzed its GRH program after a 22-month test period and found that less than one percent of the 4,300 ride sharers eligible for the GRH program the agency offers used the service in that period.

Companion Strategies: Guaranteed Ride Home is itself a companion strategy for every non-SOV commute measure. The guarantee of a ride home in an emergency provides the assurance that many people need to give up using their car for work trips.

Effectiveness: Effectiveness is largely anecdotal, but GRH seems to be a significant perceived incentive for commuters who are undecided about utilizing non-SOV modes. In the Commuter Transportation Services profile, several GRH programs noted increased ride sharing participation. In addition, a Guaranteed Ride Home may also be beneficial in retaining current non-SOV commuters by providing the assurance of emergency transportation when needed.

Implementation Difficulties: Employer reluctance due to fear of cost.

E. Parking Management

Description: Parking Management programs include a wide variety of measures that can influence the availability, cost, and location of, as well as the demand for, parking. At the employer level, parking management programs can range from the provision of specially signed, optimally located spaces reserved for car pools and van pools, to a program that includes a monetary parking allowance, monthly parking fees, and reduced fees for HOVs. The rationale behind aggressive parking management programs is that parking, while traditionally provided free to the employee, does in fact have a cost. Transferring this cost to employees while providing them with the ability to avoid this cost by choosing an alternative mode will encourage the use of alternative modes.

Market/Geographical Setting: Parking management programs can work well in both urban and suburban settings. In some areas, zoning regulations may require a minimum level of parking, which may make it difficult to limit the supply of parking.

Time Frame: Very short to short. An HOV preferential parking program can be implemented in the time it takes to create and erect signs restricting the use of certain spaces. An additional step may involve registering car pools and issuing permits to use the restricted spaces. A more involved program that includes charging for parking will require more planning and coordination among various departments as procedures are installed to distribute allowances, collect fees, and enforce compliance.

Cost: Low ($2,000) to negative. A parking management program that reserves priority spaces for HOVs can have a low cost, associated with producing signs and some sort of spot enforcement. A more aggressive program that involves parking charges can actually save a company money through the revenue generated by those fees.

Companion Strategies: Parking management strategies work best when combined with increased HOV alternatives and support services to help employees find alternatives to SOV travel. Examples of effective companion strategies include ride matching assistance and transit subsidies.

Effectiveness: Aggressive parking management programs are possibly the single most effective TDM measure an employer can take to reduce SOV travel. This is because the cost of parking, while not always passed on to the employee, is normally the most expensive component of the marginal daily commute costs (i.e., not including ownership expenses such as purchase cost, or insurance). Priority parking schemes have a very minimal impact receiving free parking can create 20% to 30% reductions in SOV mode share, depending on pricing levels and transit access programs is the anticipated and actual employee opposition to charging for what is generally perceived as an expected free benefit of employment. Management may see this strategy as having a negative impact on attracting and retaining employees. The use of a transportation allowance, that is equal to the charge for parking but may be used for any purpose, may overcome this objection by providing a financial incentive for using HOVs, without any financial disincentive (except in terms of opportunity costs) for continuing to drive alone.

Additional difficulties may arise from local building or zoning codes that maximize on site parking to ensure that parking does not spill over to surrounding streets. A parking charge can only be effective in reducing vehicle trips if there are no easy, free alternative parking locations. One out-of-state program which implemented a parking management program that combined a $40 per month parking charge, a transportation allowance, and a transit subsidy and attained a 30% reduction in SOV trips in one year. Bellevue (Washington) City Hall instituted a $30/month parking charge, along with a transportation allowance, bus pass subsidy, fleet ride program, and a guaranteed ride home program. It attained a 27% reduction in SOV travel.

F. Facilities Amenities

Description: Many tangible changes can be made to an employment facility to encourage the use of HOV modes by employees. Among these improvements are the following:

> On-site day care. The need to either drop a child off at a day care facility on the way to work or retrieve a child in an emergency situation or simply meet the day care's schedule makes it difficult for employees with day care needs to use HOVs. Having day care on-site allows a parent to bring the child to work in an HOV. This type of program could be coordinated with services provided locally through Child Care Resources. Elder care is also a need that can be supported in this manner.

Site Design. Both the way a building is situated on the site and the ease of access by public transit vehicles can influence an employee's willingness to use public transit.

Site amenities. On-site provision of services that an employee needs to access during the day can help alleviate the need for personal autos for trips during lunch or after work. Examples of these include trips for lunch, dry cleaning, postal services, and gymnasium facilities.

Bicycle lockers, showers, and changing facilities can encourage or even enable employees to bike or walk to work.

Market/Geographical Setting: Large employers (e.g. St. Patrick Hospital) or those located within a common employment center outside of the downtown business district are best able to implement these facility amenities.

Time Frame: Short to medium. In most cases, providing these types of support measures can be done by identifying a space and contracting the service. For some types of services, insurance issues need to be addressed.

Cost: Low. While these strategies call for an employer to provide the space for services, the employees shoulder the cost. It is possible to generate revenue for some of these strategies by renting space to the service provider.

Companion Strategies: These types of strategies are aimed at removing barriers to HOV use; therefore, complementary strategies that provide incentives for HOV travel and disincentives to SOV travel will make these facility-based strategies more effective. These include transit pass sales and subsidies, ride matching assistance, and parking charges, to name but a few.

Effectiveness: A recent study in Southern California looked at the site characteristics of employers impacted by the Regulation XV trip reduction requirements. A direct correlation was found between lower rates of SOV commuting and sites that had or were near the types of amenities described above. Site design considerations were also found to be a factor (e.g., safety of parking).

Implementation Difficulties: In some employment sites, finding space for these facility-based strategies may be difficult. In other areas, local zoning regulations may prevent the implementation of these programs. Structural changes to accommodate these strategies may be extensive (e.g., installation of electricity, ventilation, or plumbing to support a cafeteria).

G. Transportation Management Associations

Description: Transportation Management Associations (TMAs) are typically partnerships of employers and developers who organize to work together on transportation problems and their solutions. TMAs are formal organizations of businesses, local jurisdictions, state government, and transit agencies that are dedicated to solving transportation concerns. In 1995 there were approximately 165 TMAs nationwide, with significant numbers found in California, Maryland, New Jersey, Virginia, and Florida.

The recently formed (April 1996) Missoula Ravalli Transportation Management Association (MR TMA) was the first TMA in Montana, and was created to develop comprehensive transportation alternatives which will mitigate traffic and parking congestion in Missoula and Ravalli counties.

MR TMA goals and objectives include:

- Develop awareness of Transportation Demand Management (TDM); increase basic understanding of TDM in the two-county area; and educate the citizens of the Bitterroot Valley and Missoula on alternative methods of travel in the area.
- Enhance general public transportation by increasing bus and van service.
- Increase transportation options for low income people, the elderly and people with disabilities.
- Reduce the number of single occupancy vehicle trips made by employees at major Missoula and Bitterroot Valley area employers, and coordinate ride-sharing efforts.
- Match commuters for shared rides in regard to origin, destination, hours, required stops to and from work (such as daycare and children's extracurricular activities), and personal preferences. Coordinate vanpools and carpools for matched commuters.
- Educate employers, employees, high school and middle school students, youth groups, and others on the importance of transportation management.
- Provide technical support to employers and employees in setting up programs such as car, van and bus pools; shared rides; varied work hours; telecommuting; and park-and-ride lots. MR TMA helps with education, marketing and how-to advice. The agency will also work with groups wishing to take advantage of commuter tax breaks.
- Serve as the public's advocate in transportation planning by examining and implementing ways to alleviate present and potential impacts of population growth on area traffic.

In a more formalized way, TMAs generally offer employers a combination of four types of activities: 1) information, training, and education; 2) direct TDM services such as ride matching, van pools, and guaranteed ride home; 3) advocacy for new and improved transportation services by working with transit agencies and other TDM service providers; and, 4) assistance in complying with local transportation and air quality regulations.

TMAs are attractive as a TDM strategy for several reasons. First, most TMAs are public-private partnerships that promote improved communications between the two sectors and give businesses a collective voice in setting local transportation policies and funding. Second, TMAs can reduce employers' costs to implement work site programs by providing economies of scale. Additionally, TMAs can help build commitment and accountability for demand management activities and services.

Market/Geographical Setting: As noted above, one TMA has already been formed in this area. A separate TMA focusing on transportation issues presented by the University community may also be appropriate.

Time Frame: Short. TMAs can be organized fairly quickly (three to six months). Their ability to implement effective services depends on local initiative, funding, and the type of services to be developed. Typically, a TMA can be delivering services to commuters in one to three years.

Cost: According to a TMA survey conducted by the Association for Commuter Transportation, budgets vary dramatically by the size of the area serviced, number of members, stage of development, services offered, and sources of funding. The average annual budget is $149,000, while one third of TMAs report a budget of less than $100,000. The first year's budget for MR TMA was $70,000. National experience has shown that TMA funding is a critical issue for the long-term effectiveness of these associations.

Companion Strategies: TMAs throughout the nation have emerged as important players in trip reduction regulation. Local CTR ordinances can be crafted to recognize and encourage participation in TMAs. Most TMAs focus on a specific demand management strategies to promote and manage for their employer members. Those strategies include most of the programs and activities that employers might implement individually: ride match, van pool, promotional campaigns, subsidies, incentives, telecommuting--as well as those that work well with a number of employers--guaranteed ride home, shuttles, dial-a-ride, shared taxi service, and transit service increases.

Effectiveness: It is difficult to measure TMA effectiveness because a TMA is rarely the only group involved in trip reduction. It might not be possible to isolate TMA effects from those of CTR, local transit, and ride sharing programs, and individual employer efforts. A few TMAs have documented measurable commute trip reduction in their areas. These reductions have generally been about 6 to 7 percent, but a few, such as the Warner Center Transportation Management Organization (TMO) in California, have shown more than 10 percent over several years.

Implementation Difficulties: TMAs need a supportive political environment, committed business sector partners and adequate program resources. They also generally need time to explore options and develop commitment.

III. Telecommunications Strategies

A. Telecommuting/Home Offices

Description: Telecommuting comprises a number of situations in which an employee works at a site other than the regular work site but remains accessible by means of various telecommunications tools, such as the telephone, fax machine, or networked computer. Telecommuters may work out of their homes, from a telework center provided by a third party, or at the office of an entity related to the work site.

Telework centers are generally nothing more than empty offices equipped with typical office equipment: copier, fax, computers, modems, and perhaps some general support staff. Inhabitants of individual offices change daily as different individuals use the center instead of the main office.

Organizations with multiple sites around a region can use excess office space in one office as a telecommuting site for a worker from another office. Again, all that is needed is the use of basic office equipment. It is possible to envision a brokerage service linking workers and office space in unrelated organizations for the purpose of telecommuting.

Market/Geographical Setting: Telecommuting can be an effective strategy in any urban or suburban work environment. More important is the type of job; workers in information industries are more likely to be able to telecommute than production workers.

Time Frame: Short to medium. Successful implementation of telecommuting programs generally requires some training of the telecommuting employee, their colleagues, and their supervisors. There may (or may not) need to be space allocations and minor equipment purchases such as telephones, modems, and computers. Since telecommuting is a major departure from the way most businesses operate, it will likely be a longer term effort to induce widespread adoption of this strategy.

Cost: \$5,000 - \$10,000. Properly formulated telecommuting programs can improve employee morale and productivity. Therefore, any start-up costs may well be offset by cost savings through improved work performance.

Companion Strategies: Regulations like Trip Reduction Ordinances, which force employers to seek strategies for reducing trips, can encourage the adoption of telecommuting programs. In addition, marketing programs to encourage employers and employees to use the telecommute option could be helpful in the Missoula area. Also, working with the University of Montana to foster more awareness of telecommuting options would be a logical link.

Effectiveness: Telecommuting programs are very effective in reducing VMT and peak hour travel for the individual telecommuter. A study in the Puget Sound region showed a 55% reduction in peak period travel, and a 61% reduction in daily VMT per telecommuting occasion. However, its effectiveness as a regional trip reduction strategy is limited by the penetration of telecommuting in the work force. In Washington state, for example, only about 0.3% of the work force telecommutes on any given day of the week (1994). However, it should be noted that the current national level of telecommuting is almost 2%, and rates of 7.6% and 8.1% are seen in Los Angeles and San Francisco, respectively. As reported by the PSRC, home-based telecommuting has the potential to reduce region-wide daily VMT by up to 5%, and telework centers could achieve an additional 5% reduction.

Implementation Difficulties: Employees in some job classifications may simply not be able to telecommute. However, for those who do, the prevailing corporate culture may not initially be amenable to telecommuting because of a perception that, without a supervisor present, a productive workday is not guaranteed.

B. Advanced Telecommunications

Description: Telecommunication and computer technologies are providing opportunities for innovative TDM strategies that could not even have been conceived of ten years ago. Many of these strategies are in the testing phase. In some cases, they are still in the design phase. Undoubtedly, future advances will provide even more options. Examples of some of these programs include the following:

Video Conferencing. Currently used mainly to link meeting participants who are large distances apart, advances that lower costs could make this more commonly used, resulting in more and better telecommuting and possible reductions in non-commute work trips.

Video/Internet Shopping. More than just the Home Shopping Network, this strategy, if widely applied, could reduce shopping trips, as well as the need to link these trips onto commute trips, thus making HOV use more of an option. Combining on-line ordering with a delivery service is one application of this strategy.

Advanced Traveler Information Systems (ATIS). By collecting information from a variety of service providers (i.e., traffic conditions, bus schedules, car pool and van pool opportunities) and presenting it to the user in one place (telephone call, public kiosk, Internet site), ATIS lowers the cost of getting information about smart travel options (HOV modes, route or trip time change) and makes HOV use easier.

Dynamic Rideshare Matching. Telephone or desktop computer interfaces can allow users to tap into a rideshare agency's matching computer to automatically learn of, and communicate with, potential car pool partners. Speeding up this process allows car pools to form in "real-time"--later today or tomorrow--providing added flexibility to this option and potentially redefining car pooling away from a permanent arrangement with a set group of commuters to something that changes daily as commute times change.

These are just a few concepts that are currently being explored; undoubtedly, future advances will produce more and better ideas.

Market/Geographical Setting: Anywhere in Missoula. Some areas, such as the Missoula downtown center, or the University, may be the most feasible for some alternatives. Many innovative ideas are being developed and tested in other states, because of the need for, and the in-place infrastructure to support the development of these ideas. Once developed, however, they may be adapted for use within the greater Missoula area.

Time Frame: Medium to long. Depending upon the technology, the electronic infrastructure may or may not be in place. While the user interfaces may be easily imported from other locations, the supporting network must also be in place.

Cost: Low to medium to high. To the extent that the electronic infrastructure is put in place for other purposes, the marginal cost of developing and distributing the interface to use this infrastructure for TDM purposes may be very low.

Companion Strategies: Strategies that encourage the use of HOVs (or discourage the use of SOVs) serve as companions to these advanced telecommunications strategies.

Effectiveness: Although unknown at this time, it is anticipated that advanced technologies will have a distinct, positive impact on both commute and non-commute trips.

Implementation Difficulties: One of the main difficulties may be that these strategies are untested, and local government may be reluctant to invest in unproved ideas. As federally and state-sponsored operational tests occur throughout the country, some of these ideas may have the opportunity to prove themselves.

Current Applications: Advanced Traveler Information Systems that have been or are being tested in Washington State include the Bellevue Smart Travel Program, a personalized electronic means of dynamic ride matching; Riderlink, a demonstration of the dynamic provision of alternative transportation information via the Internet, underway with partners King County (Metro) and the Overlake Transportation Management Association and a major, newly funded public/private project in the greater Seattle area. California has developed two ATIS applications, TravInfo in San Francisco, and Smart Traveler in Los Angeles. Both of these use a variety of user interfaces to deliver travel information to the public.

F.4 Land Use/Zoning Related Strategies

IV. Land Use Strategies
A. Development Impact Mitigation

Description: Impact mitigation attempts to assess new development for its effects on existing infrastructure and services. Transportation impacts can include increased congestion, greater need for transit systems, and safety, such as effects on entrances and exits of heavily traveled roadways. These impacts result in demands for new roads and new lanes of travel; improved signalization; increased transit service and transit equipment; and re-engineering of freeway access, intersections, and driveways to decrease their hazard levels.

Impact mitigation authority is both implicit and explicit: implicit under the Montana Environmental Policy Act (MEPA) and explicit through policy decisions enacted by Growth Management Task Force.

In the past many developments' transportation impact costs were borne by the population as a whole, misrepresenting the true costs of development. To try and address this, Missoula may consider allowing the imposition of impact mitigation fees on development. Impacts on the surrounding road network are estimated and measures identified to mitigate negative impacts. Reducing vehicle demand rather than adding additional vehicular capacity is the approach under this strategy. Actions developers can take include providing priority parking for car pools, providing vans for van pools, and changing the mix of uses in the development.

Market/Geographic Setting: Developing areas throughout the city and county of Missoula.

Time Frame: Medium to long.

Cost: Low to medium. In theory, impact fees should be revenue neutral, while non-fee mitigation costs should be borne by the developer.

Companion Strategies: Impact mitigation can be effectively combined with a variety of Commute Trip Reduction (CTR) strategies, especially when firms are provided impact credit in exchange for implementing CTR programs. Additionally, developers can be required to provide transit- and pedestrian-related amenities in lieu of cash impact fee payment.

Effectiveness: Effective mitigation should address all the impacts of development. Since the effects of development are complex, the effectiveness of mitigation measures is often unknown, and political pressure often exists to reduce development costs.

B. Mixed Land Use/Jobs/Housing Balance

Description: This strategy provides for a mixture of office, retail, commercial, and residential development within the Missoula business district and areas with activity centers. Where a diverse mix of uses exists, people are more likely to rely on transit, walking, car pools, or cycling as their transportation mode choice. Because many trip generators (retail shops, services, restaurants) are found within walking distance, mixing uses allows several trips to be "chained" without creating a dependence upon an SOV. Ride sharers, transit users, and bikers/pedestrians are able to run mid-day errands from employment sites without reliance on automobiles.

A greater mix of uses can be achieved by replacing or modifying existing zoning regulations that impel single-use development. New zoning regulations should encourage uses complementary to the existing primary use(s). For example, an area of existing office development could benefit from the siting of services (e.g., day care, convenience store, restaurant) within the zone. The increased mixture of development types would allow more pedestrian and bike trips in addition to making HOV use more feasible. Careful consideration should also be given to allowing some non-conforming uses where they would not disturb the character of a neighborhood. For example, some office and light industrial uses may be compatible with residential zoning where the non-conforming use is unobtrusive visually, aurally, and aromatically.

Related to mixed-use development is providing a balance of jobs and housing within a limited area. A study by Frank and Pivo (1994) found that census tracts with an approximately equal ratio of jobs and housing had a lower rate of SOV travel than census tracts in which one of these characteristics was disproportionately represented.

Market/Geographic Setting: Mixed use development is appropriate for medium and high density areas. For example, a low density, campus-type office park (i.e. the area on South Russell near 39th Street) could benefit from inclusion of food, banking, and day care services. The provision of these services could complement ride sharing and transit use, as employees would have a reduced need for personal vehicles during the work day.

Time Frame: Medium to long term. Developing mixed-use areas could require modifications to existing zoning codes, including adoption of appropriate neighborhood design guidelines. Use changes that move an area toward a more balanced mix of uses will develop slowly as new development begins in response to zoning code revisions allowing such uses.

Cost: Generally low. Zoning changes resulting in use changes can generally be accomplished at low cost. There are potential drawbacks to mixed use that need to be addressed if implementation is to be successful; this is particularly true of compatibility issues.

Companion Strategies: Increasing transit availability is a particularly complementary strategy, as are many other alternative mode support strategies.

Effectiveness: Mixed-use development is among the most effective means to increasing the non-SOV proportion of transit mode choice. A land-use alternative to building a freeway is being examined in Portland, Oregon. In conjunction with TDM strategies, the mixed-use development pattern is projected to effect a 10.2% greater decrease in congestion (as measured in vehicle hours of delay) than building the proposed freeway would over a 20-year period to effect a 53.2% decrease in congestion in comparison to the "no-build" alternative. Puget Sound Regional Council studies suggest that mixed land-use could result in trip length and VMT reductions of up to 10%.

Implementation Difficulties: Mixing of uses raises the possibility of incompatible uses sharing an area. More of a threat than the actual occurrence of incompatibility is the political opposition of neighbors to the threat of incompatibility, real or perceived. Also, identifying uses appropriate to 'balancing' a neighborhood is difficult, and opening a single use area to other, previously prohibited uses raises the possibility that incompatible uses will inadvertently be permitted.

Current Applications: Mixed-use development was the norm for cities' central cores before the development of the interstate highway system in the 1950s and '60s. Many areas are now re-embracing the concept, as the shortcomings of automobile-dependent planning become clearer.

C. Transit-Oriented and Pedestrian Friendly Design

Description: Design elements are integral to how people interact with their built environment. In transportation mode choice, safety, accessibility, amenities, and aesthetics can play pivotal roles. Some amenities, such as walking areas that are separate from roadways (e.g., sidewalks, bike/jog paths), have an obvious impact on whether someone will consider walking instead of driving to a given destination. Other factors are less obvious. Studies have demonstrated that unless bus stops are within about a quarter mile of a traveler's destination, transit will not be considered a viable alternative. They have also demonstrated a relationship among building orientation, setback, and mode choice. Environments seen as unwelcoming--areas with lots of graffiti, streets capes with large expanses of blank walls unmodulated by windows or other 'humanizing' features, and sidewalks that are too narrow--are unlikely to be used by foot traffic. On the other hand, areas with shade trees, store fronts that open onto the street, and/or windows at eye level encourage pedestrian activity.

Transit oriented and pedestrian friendly design, with design considerations specifically geared toward encouraging walking and transit use, can effectively foster alternative mode choices. Effective design requires both a pedestrian-friendly environment and safe and convenient transit stops. Practically, this requires that shelters be placed at nearly every stop in densely populated areas (in terms of residential, retail, and/or employment densities), that pedestrian crossings are well-marked, and that pedestrian crossings at wide streets (4+ lanes) are modulated with an island at the midpoint to reduce their scale.

Market/Geographic Setting: Urban design/redesign covers a wide range of possibilities, some of which are specific to either Missoula urban or suburban applications, others to both environments. It is most applicable when coupled with existing transit service or developed in conjunction with new transit service.

Time Frame: Medium to long term. Many of the changes suggested are infrastructural. Changes may be required in zoning codes, design specifications for building orientation and modulation, transit stops, pedestrian crossings, and multiple lane roadways.

Cost: Medium to high. Zoning changes can be accomplished at low cost, as can the design recommendations. Road construction costs will be increased for boulevard-type construction when such construction necessitates additional rights-of-way acquisition, but coordination with public works directors and MDT to implement roadway changes in conjunction with scheduled paving/upgrading projects will minimize costs.

Companion Strategies: Increasing transit availability (routes and/or frequency), encouraging mixed-use development, reducing parking availability, and transit subsidies.

Effectiveness: "Building Orientation," a 1994 report undertaken for 1000 Friends of Oregon, indicates that the combined share of transit, walking, and bicycling may be tripled by appropriate changes to orientation and setbacks in urban areas. Positive effects of some of the other recommendations are less well-documented, but the negative impacts of the designs these changes will mitigate are tangible. Increased pedestrian and transit travel increases the vitality of an area, providing greater retail activity, reduced automobile congestion and its corresponding pollution, and lowered travel times for both people and freight as congestion is eased.

Implementation Difficulties: Education regarding the benefits of the necessary design requirements is essential. Resistance to increased regulation is probable among some developers, and engineers may resist some of the roadway design recommendations. However, the benefits of these changes should outweigh the reservations of most opponents. It has been demonstrated that promotional incentives such as publicly presented awards for transportation-friendly design serve to overcome some of the reluctance to design standards.

D. Residential Density Increases

Description: There is a clear relationship between land use and transportation mode choice. Strong correlations are tied to employment density, mixed land-uses, and housing density. The relationship between housing density and choice of non-SOV transportation modes is nonlinear and appears to have a threshold level of about 11 people per gross acre or 12 dwelling units per net acre. Transit usage may be insupportable below that threshold.

Actions to increase density include zoning changes to allow smaller lot size, in fill through accessory unit ('mother-in-law') development, zero lot-line construction, increased proportion of multiple family development, and adequate infrastructure to support higher land-use density (e.g., sewer and water flows adequate to handle anticipated peak demand).

Market/Geographic Setting: This strategy is appropriate for many areas throughout Missoula, both urban and suburban areas, as long as careful consideration is given to timing additions to the transportation infrastructure and services.

Time Frame: Medium to long term. Enacting the legal changes necessary to support high housing densities can be a time-consuming process, and in filling around and/or replacement of existing residences to achieve sufficient density requires the passage of considerable time. How much time is largely influenced by economic conditions, as well as by governmental efforts to encourage density appropriate to non-SOV transportation.

Cost: Medium to high. Zoning changes to effect density increases can be accomplished at low cost, but infrastructure changes necessary to support the level of residential density required to support transit (about 8 - 12 du/gross acre) may be costly. It is important, therefore, to carefully consider existing infrastructure capacity in choosing siting for high density housing.

Companion Strategies: Increasing transit availability, providing pedestrian/bicycle friendly design, and increasing the density of employment centers in neighboring areas can work synergistically to reduce SOV travel and boost other transportation modes.

Effectiveness: Increased housing density can produce reductions in vehicle miles traveled of up to 10% per household relative to areas of lower density.

Implementation Difficulties: Except for bedroom suburbs of very high employment density cities (e.g., New York City), residential densities necessary to support transit are greater than many jurisdictions' single family residential zoning requirements. Many areas have net densities of 3~ dwelling units per acre, while a review of literature suggests densities at twice that level are necessary for sustainable transit service.

Current Applications: Many central city areas have densities sufficient to support non-SOV transportation modes. Outside the more urbanized areas, Planned Residential Developments and Planned Unit developments can yield sufficient densities, as can in filling of even relatively small jurisdictions, given appropriate zoning.

E. Employment Center Density Increases

Description: As noted above, there is a clear relationship between land use and transportation mode choice, including employment density. As with residential density, the relationship between employment density and mode choice is nonlinear, with little reduction in single occupancy vehicle mode share at densities of less than 30 employees per gross acre. SOV mode split drops below 50 percent at employment densities of greater than 125 employees per gross acre.

Actions to increase density include changing zoning to allow greater lot coverage, increased vertical construction, and/or reduced parking requirements, and ensuring adequate infrastructure to support higher land-use density (e.g., sewer and water flows adequate to handle anticipated peak demand). Other changes may include transfers of development rights from areas where a lower density may be desirable (e.g., some outlying residential areas or environmentally-sensitive areas) to areas where greater densities are desired.

Market/Geographic Setting: This strategy is appropriate for areas intended for high concentrations of employment (e.g., financial/commercial centers, industrial areas, civic centers) vis-a-vis other uses such as residential or retail/commercial. These concentrations are generally found in urbanized locations.

Time Frame: Medium to long term. Enacting the legal and infrastructure changes necessary to support appropriate employment densities lays the groundwork for the slower process of employment build-up. The latter is largely influenced by economic conditions and labor availability and quality, as well as by governmental efforts to encourage socially appropriate and desirable location choices.

Cost: Medium to high. Zoning changes resulting in density increases can be accomplished at low cost, but infrastructure changes necessary to support the employment densities (2125 employees per gross acre) may be costly. It is important, therefore, to carefully consider existing infrastructure capacity in choosing appropriate siting for regional employment centers. Much of this impact will be mitigated by the long-term nature of densification.

Companion Strategies: Increasing transit availability (including link shuttles), reducing parking availability/ increasing parking costs, and increasing residential density in the areas that provide workers to the employment center can work synergistically to reduce SOV travel and boost other transportation modes. It may be appropriate in some instances to offer guarantees of less dense residential neighborhoods to gain support for the greater densities in employment centers.

Effectiveness: Employment densities of greater than 30 employees per gross acre have a strong correlation to changes in transportation mode allocations. Change from SOV to other modes is most pronounced at densities of greater than 50 employees per gross acre, and densities of greater than 125 employees per gross acre result in a majority of trips falling into non-SOV categories. Net change potential is about +30 percent for non-SOV modes, resulting in an approximate 50-50 split between SOV and non-SOV modes.

Implementation Difficulties: The density required to support significantly greater non-SOV transportation mode choice is much greater than the employment densities currently found in many employment centers in the state. In particular, 'campus' developments and single-story office and manufacturing parks preclude the densities desired in an employment center. Education of jurisdictions and employers regarding the advantages and feasibility of higher-density development may alleviate some reluctance (lower infrastructure costs, tax incentives, lower costs due to exemptions from parking minimums).

F. Parking Management

Description: As a land-use strategy, parking management refers to actions undertaken by local, regional, or state governments that can affect the supply, location, cost, and demand for parking. Examples of these types of actions include the following:

Reducing or Eliminating Minimum Parking Requirements: It is common for parking, building, or zoning codes to include a minimum number of spaces, often based upon gross square footage. These minimums can often be reduced within certain land-use categories without detrimental effect.

Setting Maximum Parking Standards: Setting a maximum parking space requirement in jurisdiction codes can both save developer's money and prevent the oversupply of parking.

Allowing Shared Parking: Allowing closely located developments with different peak parking hours to share parking can both save developer's money and prevent the oversupply of parking.

Providing Joint Use Spaces for Park & Ride Lots: Developments located near existing or potential transit lines can be allowed to allocate a portion of their spaces to Park & Ride use. This may be especially relevant to developments that have peak parking periods outside the normal commute periods.

Allowing Flexible Requirements: Developers can be permitted to reduce the number of parking spaces provided in exchange for actions (including monetary contributions) that support transit, ride sharing, or HOV facility construction.

Utilizing Parking Lanes: Parking restrictions could involve opening some (current) parking lanes up as travel lanes, either full-time or only at peak commute hours, and either to general purpose travel or as dedicated HOV lanes. Alternatively, parking restrictions could also be implemented by converting parking lanes to other uses: wider sidewalks, amenities such as street trees and grass strips, or dedicated bicycle lanes, all of which can encourage non-SOV mode choice.

These strategies may need to be combined with others to prevent spill-over parking from negatively impacting nearby residential or commercial streets. These complementary strategies can include residential parking permit zones or parking meters. Portions of the development can also be preserved as open space for future use, if needed, as parking.

Market/Geographical Setting: Any urban or suburban setting. Although implementing parking management strategies may be easier in dense urban settings where parking is already in short supply, aggressively restraining the supply of parking in suburban areas may have a high impact on reducing congestion.

Time Frame: Medium to long. Changing jurisdiction codes typically requires a lengthy period of analysis and review, but this is already underway in CTR jurisdictions. The effect of code changes that affect only new construction will only be felt over a long period.

Cost: Low. Most of the code changes discussed will actually result in reduced development costs. Reductions in the amount of parking necessary (as consumers choose other methods of travel) will also generate savings, as suburban parking provisions can cost between $1,000 to $2,000 per space, with urban costs much greater. Converting parking lanes to alternative uses would be low cost in most instances, although it would not be the revenue generator some of the other options would be.

Companion Strategies: It is important that actions to reduce the supply of parking, and therefore to make driving alone more difficult, be accompanied by companion strategies that assist travelers in switching to alternative modes. These might include the provision of additional transit service, ride matching assistance, or assistance to employers in setting up telecommuting programs. In addition, land-use strategies that encourage mixed-use development can make services more easily available to car-less commuters during the work day.

Effectiveness: While parking management has proven to be effective at the employer level, there are fewer empirical data available to estimate the effectiveness of the land-use strategies described above. Studies suggest a 1% to 5% reduction in VMT if region-wide parking charges were implemented.

Implementation Difficulties: The main difficulty in implementing code changes would lie in the steps required to move local governments to action on this issue. Resistance can be expected.

G. On-Site Amenities

Description: This strategy involves the siting of amenities that are significant trip generators (e.g., day care centers, bank branch offices, fast food restaurants, grocery stores, and coffee shops) on-site at employment centers, transit centers, or Park & Ride facilities. With access to these services at trip ends, the need for an SOV (to undertake 'chained' trips before or following work, or to run mid-day errands) is reduced or eliminated. The effect of this strategy mimics, albeit on a smaller scale, the effects of mixed-use development.

Market/Geographic Setting: Major employment sites throughout Missoula, the transit centers, and park-and-ride facilities.

Time Frame: Short to medium. Employer driven changes, such as siting a day care in an existing (employer owned/occupied) building can often be effected quickly. Other changes, such as siting amenities at Park & Ride lots, can take longer; bidding may be required, and businesses (banks, restaurants) may have to be convinced of an operation's viability at such sites.

Cost: Low to medium.

Companion Strategies: Any strategies that encourage use of HOVs or discourage use of SOVs can be coupled effectively with locational choice. By combining strategies, a larger market can be provided for the amenities sharing the site, increasing the chances of their success, while those services concurrently provide the freedom to transact essential personal business without requiring a car at work.

Effectiveness: A recent study of California employers impacted by Regulation XV found at least an indirect correlation between nearby amenities and the degree of success of employer commute trip reduction programs at reducing SOV use. No other studies on the specific effectiveness of locational choice strategies are available; however, it seems likely that, because location choice shares many of the characteristics of mixed-use development, its effectiveness will be similar to that of mixed-use development.

Implementation Difficulties: Implementation will require changes in land-use policy for both employment and transit facilities. Rather than focusing on single use areas--either one employer isolated at a work site or a Park & Ride lot absent complementary uses--these entities need to be cognizant of and encouraging of complementary uses.

F.5 Mandatory TDM Strategies

V. Tax/Pricing Related Strategies
A. Gasoline Tax Increases

Description: Vehicle pricing measures are designed to increase the operating costs of vehicles to the point where travelers will reduce their driving. Gasoline taxes have a long history in the United States and are generally accepted by the public. In Montana, the state legislature specifies uses for expenditures from gas tax revenues. They are generally limited to expenditures for "highway purposes," which means that they finance the construction and maintenance of roads and other DOT activities. Legislation would have to be enacted that would allow local jurisdictions (i.e. Missoula county) to implement a local options gas tax, but may encounter resistance in that consumers can easily cross jurisdictional lines to buy gas.

Market/Geographic Setting: The gasoline tax has been one of the most discussed option for increasing vehicle pricing, but most of the analysis has addressed reduced oil consumption and automobile emissions rather than reductions in travel or VMT. It is generally agreed that, among pricing alternatives, increased gas taxes would have the broadest impact on travel behavior, as they would impact all auto users. The fuel tax can be applied on a federal, state, or local basis. It can not be targeted at travelers using specific corridors, nor can it be targeted at peak hour highway users.

Time Frame: New gas taxes can be implemented in a relatively short time. A substantial increase, however, which may be needed to significantly affect travel choices, is likely to require a medium to long time to build political support.

Cost: Increasing fuel taxes will bring added revenues to the state and localities. It should be noted that fuel taxes, like sales taxes, are commonly seen as regressive in outcome--creating inequities among income classes, as well as excessive costs for those without travel alternatives.

Companion Strategies: This TDM measure should not be implemented without the presence of travel alternatives, such as expanded transit and ride sharing services.

Effectiveness: It is generally acknowledged that a significant fuel tax will be needed to impact travel behavior. Because of the general elasticity of travel demand, a rebound effect (movement to cars with better fuel consumption) can take place. And over the long run, moderately increased fuel costs may be absorbed by the consumer without much change in travel. The Puget Sound Regional Council modeled a $2.00 per gallon increase in fuel taxes across the four county Puget Sound region and predicted a 7.2% decrease in VMT and an 8.6% decrease in vehicle trips (along with a $1 billion + increase in annual tax revenues). With fuel taxes as high as $3.00 per gallon, up to a 10% reduction is estimated. Smaller tax increases in the range of $1.00 per gallon or less would result in a maximum VMT reduction of 4%.

Implementation Difficulties: The fuel tax is a good revenue generator and can be implemented and administered easily and quickly. The drawbacks are two: additional taxation of any kind would meet with strong resistance, and gas taxes are hard to justify as a corridor or congestion management measure.

Current Applications: Fuel taxes are used throughout the country to fund general road maintenance.

B. VMT Tax

Description: A tax on vehicle miles traveled is a way to restrict travel. All motorists already pay the annual vehicle registration fees. This annual contact with motorists could be used as an opportunity to charge auto users for road use. The state or local government would collect the VMT according to odometer readings taken annually as part of the registration process. The tax could be assessed on each mile traveled or on a stepped fee (block rate) basis.

Market/Geographic Setting: A VMT tax could be implemented on a statewide basis or by local jurisdictions; because of equity concerns it should be applied state- or region-wide. Because the tax would be imposed on the overall use of a vehicle, it should impact all auto travel. Current technology does not permit a VMT tax (vs. a toll) to be applied for travel in specific corridors or during specific times of the day.

Time Frame: The VMT Tax is a medium to long-term strategy because of political difficulties in implementing a "new" tax.

Cost: A VMT tax would bring new revenue to the state or locality.

Companion Strategies: This TDM strategy, like other pricing measures, should not be implemented without the presence of travel alternatives, such as expanded transit and ride sharing services.

Effectiveness: VMT charges do discourage travelers and reduce the total number of miles driven. Estimates range from an 11% reduction in VMT and a 10% reduction in vehicle trips with a $0.05 per mile charge.

Implementation Difficulties: The administrative structure is already in place to implement a VMT tax. The potential to implement a new tax, however, may be politically doubtful for the near future. The VMT tax raises equity issues and might impact the mobility of lower income groups and suburban/rural residents to a disproportional degree. In addition, programs to prevent odometer fraud might have to be strengthened.

Current Applications: Many communities and regions have considered this measure and are evaluating its potential. It has been proposed generally as an emissions related tax and a potential new revenue source. Other localities are evaluating the use of a VMT tax like a toll to allow highway users to be billed for their use of selected roadways. This option is closer to a congestion pricing scheme.

C. Congestion Pricing

Description: Congestion pricing is the imposition of fees for traveling on a congested transportation facility or in a congested area. The concept is not new. It has been widely used in other industries, including airlines, telephone companies, and electric utilities, in which product demand creates predictable peak and off-peak periods. Technological developments are now making practical applications possible for roads, highways, bridges, and for access to specific areas or zones.

Congestion pricing measures are defined by the method chosen to impose charges, the selection of technology, and the type of facility or area to which it is applied. Tollgates involve charging for the use of particular roadways. Tolls have been employed for many years on American turnpikes and bridges. Fees can now be collected inexpensively without toll booths. Advanced collection technology that records the passing of vehicles is already in use on tolled facilities in the U. S. and abroad.

> Area-wide or cordon pricing defines a restricted area and charges users to enter or exit specified zones such as a downtown central business district or suburban shopping area. The city-state of Singapore has operated an area pricing scheme, with great success, since 1975.
>
> Automatic Vehicle Identification (AVI) uses an electronic system (transponders and detectors) to identify vehicles and charge an appropriate road fee. The fees can be varied by the time of day, level of congestion, miles traveled, and choice of roadway to create a complex region-wide pricing program.

Market/Geographic Setting: Although tollways can be implemented for any restricted access facility, congestion pricing schemes are generally applicable only for those that are highly congested. Technological advances have now made possible a variety of pricing schemes that can be applied at single access spots, for specific highways or roadway segments, or for entire regions. They can also be varied to impact only peak hours or SOV travelers.

Time Frame: Virtually all congestion pricing schemes should be considered long-term solutions. It would conservatively take 5-10 years to secure the political support necessary for such an option.

Cost: Congestion pricing can yield substantial revenues.

Companion Strategies: Congestion pricing will require public education and improved access to transportation alternatives. According to opinion surveys in some states, skepticism about the use of revenues is a critical barrier to public acceptance of congestion pricing. Consequently, pricing proposals must provide for careful allocation of new revenues to reduced taxes and improved transportation services. A Southern California analysis showed that pricing would generate sufficient funds to significantly reduce local fuels, sales, and property taxes and fund highway, transit, street, and pedestrian improvements. By returning two-thirds of the revenues to travelers in the form of tax reductions and earmarking the remainder for infrastructure throughout the area, the recommended California package could ameliorate the negative consequences of congestion pricing.

Effectiveness: Congestion pricing could have a substantial impact in reducing vehicle miles traveled (VMT), total trips, and vehicle hours of travel, up to 7 percent.

Implementation Difficulties: Before congestion pricing can be adopted and implemented, public and political support must be addressed. A variety of travel alternatives must be available. New technologies must be tested and accepted by the public. And enforcement could be a critical component of an effective system.

Current Applications: Tollgates have been utilized extensively in the eastern U. S. after originating with the New Jersey Turnpike. Other recent experience has been documented for the Oklahoma Turnpike and in Oslo and Trondheim, Norway. The first "smart card" system, which automatically debits a toll electronically, will be introduced soon in Orange County, California. Area-wide pricing is well documented from the Singapore experience. Automatic Vehicle Identification (AVI) has been demonstrated in Hong Kong.

D. Parking Tax

Description: Parking in the downtown Missoula area is governed by the Missoula Parking Commission. Parking pricing can be implemented at the employment site, through metered spaces on the street, in commercial parking lots, and at destination lots (shops, malls, parks, public facilities). One form of parking pricing is the implementation of a parking tax. The state legislature would have to authorize a local-option parking tax.

Market/Geographical Setting: Parking pricing can be effectively implemented only in dense, urbanized areas where there is limited opportunities for spill-over parking. As a jurisdictional or area-wide pricing strategy this measure requires local/regional decisions to be implemented.

Time Frame: The implementation of a citywide tax, including the variety of off-street parking lots, would require new legal authority. Given the time needed for state legislative action, local tax adoption, and overcoming public resistance, this is considered a medium- to long-term strategy.

Cost: Parking taxes will produce net revenue to the jurisdiction, the amount of revenue would depend on the amount of tax imposed, less the cost of administering the tax.

Companion Strategies: Like other pricing measures, a parking tax is difficult to implement without the assurance of travel alternatives such as expanded transit and ride sharing services. Because of the direct impact on commuters, this strategy will be easier to implement with the involvement of employers under a trip reduction ordinance.

Effectiveness: Pricing studies indicate that region-wide parking charges can result in a 1% to 5% reduction in VMT and vehicle trips, depending on the level of parking charge.

Implementation Difficulties: Region-wide parking charges will require changes in state law and local adoption of parking taxes and/or parking pricing controls. Both will require overcoming negative public sentiment and strong opposition from the private sector. Additional problems are inherent to parking pricing. This measure may create spot congestion as motorists search for cheap parking. Congestion may also increase as the numbers of car pool drop-offs increase in the effort to avoid higher parking fees. A serious adverse effect of parking regulations is the spill over into nearby unregulated areas. Consequently, enforcement must be well organized. Finally, parking pricing may create inequities among income groups and between long- and short-distance travelers.

F.6 Institutional and Regulatory TDM Strategies

VI. Policy and Regulatory Strategies
  A. Trip Reduction Ordinance
    1. State Legislation
    2. County Ordinance

Description: Trip reduction laws often require developers, employers, or building managers to provide incentives for occupants or employees to use HOV alternatives. In nearby Washington state, a Commute Trip Reduction (CTR) Law was enacted in 1991. This law requires cities and towns in EPA non-attainment areas to adopt CTR ordinances affecting large companies (100 or more full time employees) within their boundaries. The large employers are required to develop plans to reduce the number of SOV commuters by 15%, 25% and 35% over ambient levels by 1995, '97, and '99, respectively. Company plans must be submitted to jurisdictions for approval. Companies that do not meet their trip reduction goals may need to amend their plans on the basis of jurisdiction recommendations.

Washington's CTR law is similar in many ways to trip reduction ordinances (TROs) or regulations adopted in other states. The first of these was Regulation XV of California's South Coast Air Quality Management District (the regulation has now been rescinded). In most cases, TROs are adopted because of air quality concerns, not explicitly as congestion mitigation measures. TROs generally place the burden of trip reduction on large companies and target commute trips. This strategy makes pragmatic sense in that large companies are best placed to implement programs affecting their employees.

There are a number of ways in which a CTR law could be strengthened to affect more commuters. The threshold number could be dropped from 100 to 50 employees to bring more companies under its scope. Definitions could also be tightened so that companies at or near the threshold become affected by the law. CTR could be extended to cover schools (including students) and other types of full-time employment.

Market/Geographical Setting: A CTR law could be implemented in the most populous counties in the state. The linkage between air quality and road congestion ensures that CTR can be used where it is most needed.

Time Frame: Medium. Adoption and implementation of the CTR law must go through the state and local legislative process before being implemented at employment centers.

Cost: Low to moderate. There are costs associated with adoption of CTR at each legislative level, monitoring costs associated with reviewing plans, and program costs associated with the trip reduction programs. Whereas the institutional costs are borne by the public sector, the program costs are largely borne by the private sector, except where new public services must be added to accommodate increased demand.

Companion Strategies: Most TROs require employers to act to influence employee commuter behavior. Therefore, strategies that provide services they can use, such as increased transit or rideshare matching assistance, will be beneficial. Additionally, marketing services will help raise the general awareness level and can be used by employers to reach out to their employees.

Effectiveness: As currently being implemented around the country, TROs are estimated to effect a 0.1 to 4.0 percent reduction in region-wide VMT. In Washington State initial analysis of impacts of the Commute Trip Reduction Law to date point towards a resultant reduction in SOV commuting and in VMT, however, it is difficult to isolate CTR from other possible causal factors. Expanding those affected by the TRO may increase the impacts.

Implementation Difficulties: In an anti-regulatory political climate, expanding the reach of a TRO may be very difficult. The equity of placing the burden of trip reduction on large employers may raise questions, as would the ability of employers in non-urban areas to meet anticipated goals.

Current Applications: Eight Washington counties and the larger cities within them have currently adopted Commute Trip Reduction ordinances. In Southern California trip reduction regulations have been adopted and amended many times.

TABLE F-1
Cost Estimates of Projected TDM Programs
(Cost per year, commencing January 1, 1998)

PROGRAM DESCRIPTION	Potential Effectiveness (% VMT Reduction)	Annual Program Expense
Public Mode Support Measures		
Public Education and Promotion	* Up to 3%	$120,000
Area-wide Ridematching Services	0.1-3.6%	20,000
Transit Services	Up to 2.5%	200,000 +
Vanpool Service	Up to 8.3% (commute)	150,000
Transit and Vanpool Fares	Up to 2.5% (regional)	150,000
Non-motorized Modes	0 - .2% (regional)	20,000
Park and Ride Lots	0 - .5%	50,000
Public Mode Support Subtotal		710,000
Employer Based TDM Measures		
Monetary Incentives	8 - 18% *VTR* at site	40,000
Alternative Work Schedules	Up to 1.0%	5,000
Commute Support Programs	0.1 - 2.0%	5,000
Guaranteed Ride Home	unknown	2,000
Parking Management	20 - 30% *SOV* site red.	0 (May generate $$)

PROGRAM DESCRIPTION	Potential Effectiveness (% VMT Reduction)	Annual Program Expense
Employer Based TDM Measures, continued		
Facility Amenities	minimal	0 (May generate $$)
Transportation Management Associations	6 - 7% commute trip red.	40,000
(Note: Projections are based *without* CTR ordinance)		
Employer Based TDM Measures Subtotal		92,000
Pricing Strategies		
Gasoline Tax Increases	4 - 10%	Revenue Producing
VMT Tax	0.1 - 11%	Revenue Producing
Congestion Pricing	Up to 5%	Revenue Producing
Parking Tax	1 - 5% VMT and trip red.	Revenue Producing
Pricing Strategies Subtotal		☺
Telecommunications Strategies		
Telecommuting	Up to 10%	5,000
Home Offices	0.1 - 2%	0 - 10,000
Telecommunications Strategies Subtotal		15,000
Land Use Strategies		
Development Impact Mitigation	Varies	5,000
Mixed Land Use / Jobs / Housing Balance	Up to 10%	-0-

PROGRAM DESCRIPTION	Potential Effectiveness (% VMT Reduction)	Annual Program Expense
Land Use Strategies, continued		
Transit-Oriented and Pedestrian Friendly Design	varies	Not Included
Residential Density Increases	Up to 10% per household	Not Included
Employment Center Density Increases	SOV work trips up to 50%	Not Included
Parking Management	1 - 5%	-0-
On-site Amenities	unknown	-0-
Land Use Strategies Subtotal		5,000
Policy and Regulatory Strategies		
Trip Reduction Ordinance	.1 - 4% (Some models +)	20,000
Policy and Regulatory Strategies Subtotal		20,000
TOTAL ANNUAL TDM PROJECT BUDGET		842,000